

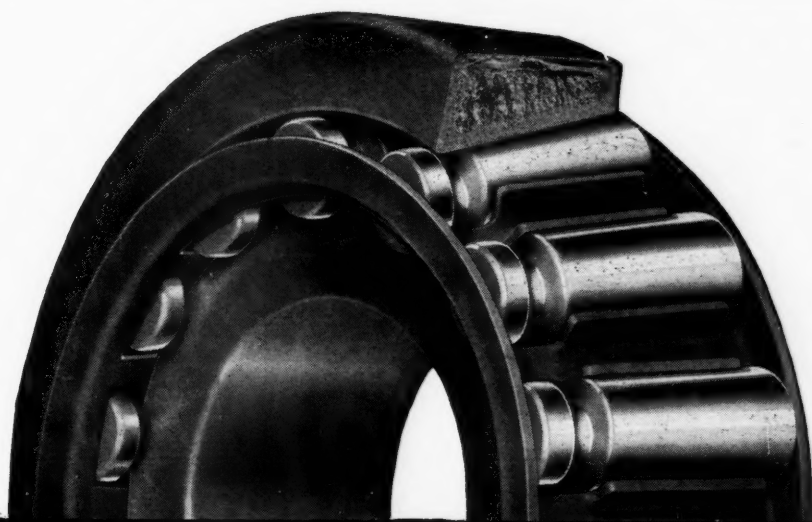
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The AUTOMOBILE

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અમરીકામાં જ નહીં પણ
દુનિયાના સર્વે જાગોમાં જ્યાં
અમેરીકન અને યુરોપીયની
મોતોકારો અને મોતોરજૂકો
તથા ટ્રેક્ટરો વપરાય છે
ત્યાં તીમકન તેપરડ રોલરબેરિંગ્સ
થો ધણો ફાયદો થાય છે.

Not only in the United States
But in every country where
Well built American and European
automobiles
—and motor trucks
—and tractors operate
Timken Tapered Roller Bearings
In an ever ascending majority
Are consistently conserving power

The original Parsi, and the American translation, of a Timken Bearing
advertisement appearing in *Jam-e-Jamshed* of Bombay

THE TIMKEN ROLLER BEARING CO, CANTON, OHIO

Timken Tapered Roller Bearings for Passenger Cars, Trucks, Tractors,
Trailers, Farm Implements, Machinery, and Industrial Appliances

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CONCENTRATION IN BUYING MEANS

Standardization of Product

Every executive in the automotive industry knows that "standardization of product" is the big essential today.

Motors have been standardized; axles have been standardized; so have transmissions, radiators wheels, even bodies are built to a certain standard.

But automobile body hardware never has, up to the present. It has been necessary to go here for window regulators, there for door hinges, somewhere else for windshields, and so on, constantly changing, constantly substituting and redesigning.

Now, however, it is entirely different. Ternstedt, with its new and immensely greater facilities, is in position to supply hardware equipment *complete* for all automobile body work, permitting the body builder to maintain a *uniform* standard of quality in each and every body built.

Window Regulators, Curtain Rollers, Sunshades, Door Panels, Door Bumpers, Anti-Rattlers, Windshield Wipers, Windshields, Window Sash, Strap Hinges, Concealed Hinges, Piano Hinges, Rear Deck Locks, Rear Deck Hinges, Rear Deck Lid Braces, Screw Machine Products, Channel and Shapes, Die-Castings, Open and Closed Body Door Locks, Other Miscellaneous Automobile Hardware. All Kinds of Stampings.

From the comprehensive Ternstedt line it is a simple matter to choose the *complete* assortment of hardware required for any type of body. In fact, Ternstedt engineers have carefully arranged a series of hardware groups to exactly conform with bodies for either the low, medium or higher priced cars. This service is purely for your convenience and may be entirely disregarded when making a selection, if desired.

Ternstedt Hardware is found as *exclusive* equipment in a large number of the foremost motor cars. Its worth is definitely established and needs no further mention here.

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TERNSTEDT MANUFACTURING COMPANY—DETROIT

LARGEST BUILDERS OF AUTOMOBILE BODY HARDWARE IN THE WORLD

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Automobile Body Hardware

...BUILT • BETTER • FOR • BETTER BODIES...

AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

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NEW YORK—THURSDAY, AUGUST 25, 1921

No. 8

Practical Data Gathered for Use in Selling Cars

N. A. C. C. survey gives facts of special value. Car buyers are chiefly influenced by practical performance features. Here is presented a critical analysis of results and their bearing on present practice.

By Norman G. Shidle

THE need for more facts in connection with car merchandising is gaining recognition throughout the industry. In several instances, individual manufacturers are spending large sums of money and are making extensive efforts to obtain such facts and to correlate and interpret them correctly. The task of analyzing markets and of determining with some degree of accuracy how to sell to them is really only in its primary stages so far as automobile merchandising is concerned.

The interest taken by manufacturers, however, in every recent attempt to analyze the selling situation and to accumulate real merchandising facts indicates that definite progress is to be expected. Perhaps the most important recent effort along this line is the attempt of the N. A. C. C. to learn from car owners what factors influence the owner most in buying a car. More than two thousand replies were received from all parts of the country in answer to a questionnaire which asked the owner to indicate his preferences "in selecting an automobile, in order that the manufacturers may be guided by the advice of the consumer in building and marketing cars."

The general scope of the questionnaire is familiar to manufacturers. It covered the following points:

Appearance
Appointments
Comfort
Economy
Endorsements
Endurance

Flexibility
Hill Climbing
Price
Service
Specifications
Speed

The owners were also asked to indicate whether or not they were interested in slogans and whether or not their choice was influenced by emphasis upon some special feature, such as axles, engines, etc.

The digested replies give some interesting data upon which to base advertising and merchandising plans. In utilizing the replies for this purpose, however, the scope of the inquiry, its advantages and defects, and its limitations must be carefully considered. The usefulness of the results is unquestioned, however, provided they are used with a proper evaluation of the various factors involved.

The chart shown in Fig. 1, which was prepared by the N. A. C. C., indicates the importance given to the various factors by owners of cars in three price classes. Taking all the replies together it appears that automobile buyers, as typified by those replying to the questionnaire, are more interested in the endurance qualities of the car than in any other

characteristic. Economy of upkeep comes second, while the item of price takes third place.

Then follow in order comfort, appearance, service, hill climbing, flexibility, endorsements, specifications, speed and appointments.

Only a few aspects of this general analysis, however, are of much importance from a merchandising standpoint. Selling a middle priced car involves different methods and different variables than selling a high-priced car or a Ford.

But the great significance of endurance is attested by the fact that each of the three class of owners, as well as all the owners together rate it as the most important in influencing their choice of a car. The majority of men having money to invest in an automobile, whether the sum be \$415 or \$15,000, are chiefly interested in how long the car is going to last. At nearly every other point there is some divergence of opinion in each of the price classes.

This would indicate that greater selling emphasis should be placed upon endurance qualities than upon any others. The value of such studies as this is indicated by the apparent failure of car merchandisers to properly evaluate the various selling points in the past. A casual survey of some forty different passenger car advertisements, for instance, shows that in only one case was endurance the predominant theme, while it appeared as a subordinate point only two or three times.

This example in itself is an excellent indication of the need for some accurate data upon which to evaluate selling points; some standards by which to judge the selling appeal. Such data is not at present available except to a very limited extent. Every intelligent effort to compile such information is a step in the right direction. Exceptional results cannot be expected in a short time, because the accumulation of material of this kind involves the analysis of many human and psychological factors which cannot be readily determined and estimated. Considerable study and experimentation will be necessary before anything like accurate results can be obtained.

But definite, though limited, progress can be expected and can be made in each instance. The N. A. C. C. survey under discussion can be made immediately useful in a merchandising way. To do this, however, the limitations of the survey must be considered and its real scope defined. Then it will be possible to discuss specifically the relation of the results of this survey to past practices and to future methods.

The questionnaire was sent to 20,000 persons picked in blocks from automobile registration lists in every State in the Union. Replies were received from about 10 per cent of this number. The replies, however, were distributed in such a way as to be representative of the country as a whole. Ten per cent of the replies received were from Ford owners.

It was discovered, moreover, in analyzing the returns, that the law of averages began to work rather accurately after the first one hundred replies had been received: that is, the results obtained from the first 100 scattered replies were changed but little in the final returns. This would indicate that the survey represented fairly well a typical cross section of American automobile buyers. This assumption is further strengthened by the fact that one individual car manufacturer recently sent out a similar questionnaire to a different list of owners and the results were almost identical.

On the other hand, too much significance should not be attached to the actual position of the various factors in the list, because the predominance of one over an-

other was so close in several instances as to have little meaning. Returns from 20 States, covering more than 30 makes of cars, on the index basis of 100, for instance, give the following emphasis to the different points:

Endurance	15	Hill Climbing	7
Economy	14	Flexibility	6½
Comfort	9½	Endorsements	6½
Price	9½	Specifications	6
Appearance	8	Speed	5½
Service	7½	Appointments	5

These percentages are for the total group, and are significant chiefly as showing the importance given to endurance and economy in comparison with the other features.

The other factors necessary to consider when using this survey for merchandising purposes are more difficult to evaluate. The psychology of those answering the questionnaire must undoubtedly play a large part, however, in estimating the value of the results. A man does not always know accurately just what things do influence him strongly. Sometimes he is influenced by certain things, because he knows he can take others for granted.

Hill climbing, for example, takes seventh place in the total list. This low place may well be the result of the general opinion on the part of buyers that practically all American-made cars are capable hill climbers so far as average service goes. Such reactions on the part of the man answering the questionnaire must be considered. Then, too, a man does not always act in practice as he states formally he believes in acting.

With these and other similar limitations and variables in mind, the detailed results of the questionnaire can be adapted to present selling problems.

We have mentioned a casual survey of owner advertising of some forty different passenger cars. Though not scientifically accurate, this survey may serve as a typical cross section of present automobile advertising. To compare the points emphasized in these advertisements with the points considered important by typical owners, as shown in the N. A. C. C. survey will be an interesting commentary on present methods.

The matter can best be discussed by price classes as noted previously. Since Ford is the only car in the "below \$500 class," it is hardly worth while to attempt a discussion of this class in the present article. For comparative purposes, however, we may list the influence of the various factors as they appealed to Ford owners. The order was as follows:

	Per Cent		Per Cent
1. Economy	17	7. Hill climbing	6
2. Price	16	8. Flexibility	5
3. Endurance	15	9. Endorsements	5
4. Service	11	10. Speed	3
5. Comfort	9	11. Specifications	3
6. Appearance	7	12. Appointments	2½

The cars in the "over \$3,000" are also limited in number as compared with those in the middle price class as the latter is defined by the N. A. C. C. for purposes of this analysis. It is interesting to note, however, that the owners of this class, which has sometimes been considered largely a luxury class, are more insistent upon endurance than any other group, 19 per cent of those replying placing this quality first.

This high-priced group, moreover, rates economy as of practically the same importance as comfort, a point which apparently has not been fully recognized in the past in merchandising this type of car.

It will be noted, also, that the buyers of high-priced cars place about the same value upon appearance as middle-priced car users. A study of the results in connection with the replies of the owners of these high-priced cars, in fact, indicates that even this wealthy class of buyers is primarily interested in the practical and utility phases of the car they buy.

The results in this class are as follows:

Per Cent	Per Cent
1. Endurance .....19	7. Price 7
2. Comfort .....11	8. Flexibility 7
3. Economy .....10	9. Endorsements 6
4. Appearance 9½	10. Specifications 6
5. Hill Climbing 7½	11. Appointments 5
6. Service 7	12. Speed 5

The line for middle-priced cars is the most interesting for merchandising discussion. To compare past performance with the standards set up by the results of this N. A. C. C. survey, we may list in parallel columns the relative selling importance of these various factors as estimated (1) by those answering the questionnaire and (2) by the survey of some forty different passenger car advertisements appearing during recent months. The line-up is as follows:

N. A. C. C. Buyers' Survey

1. Endurance
2. Comfort
3. Price
4. Appearance
5. Economy
6. Service
7. Flexibility
8. Hill Climbing
9. Endorsements
10. Specifications
11. Speed
12. Appointments

Survey of Car Advertisements

1. Economy
2. Appearance
3. Price
4. Speed
5. Hill Climbing
6. Endorsements
7. Comfort

8. Endurance
9. Flexibility
10. Service
11. Appointments
12. Specifications

Only very general deductions, of course, can be drawn from such a comparison. In some of the advertisements analyzed, for example, it was difficult to determine the predominant note. Many of them claimed perfection for the car in every particular.

If an additional classification had been made to include those advertisements which really emphasized nothing whatever of a specific nature; which confined

themselves to general statements concerning quality, wonderful performance, etc., the number in that class would exceed that of any other group. This point in itself is significant.

The replies to the N. A. C. C. questionnaire indicate one fact very definitely. Car buyers are interested in specific things when they consider buying a car. In this middle price class they evidently want to know how long they can expect the car to last and the reasons for such expectations.

The definite way in which the owners checked the N. A. C. C. query shows that they are fully aware of the things to be considered in buying a car. They are not specially impressed with the fact that a car is a "thorobred"; they want to know how long it will last, how

much it costs, and what are its riding qualities. They are not specially interested in being told how beautiful a car is; they can see that for themselves. They want to know what service they may expect from their investment.

It might seem that manufacturers have been dwelling too much on economy features. This is probably not true, despite the fact that economy ranks fifth in the middle price class list. It must be remembered that this survey has just been completed. The recent decline in gasoline prices has doubtless had a psychological effect upon owners. Men in the industry, thoroughly familiar with the petroleum situation, realize that economy of operation is to be one of the big problems of the near future. These facts are not apparent at present, however, to the general run of

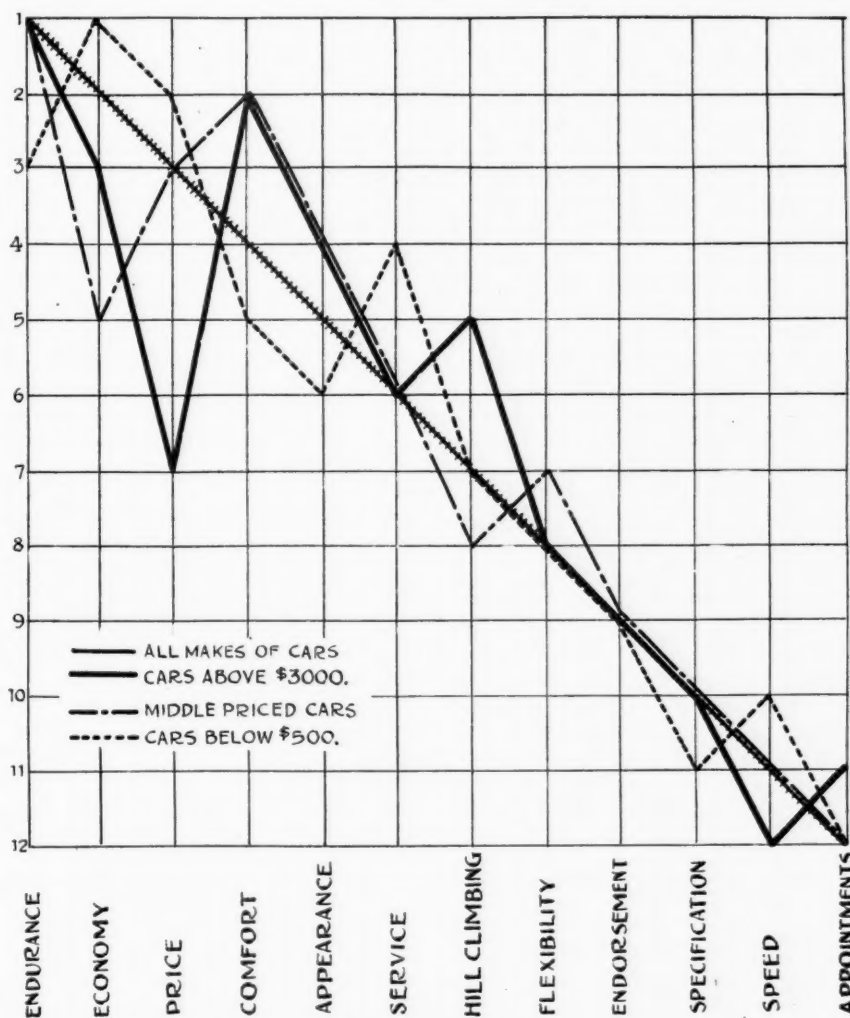


Fig. 1—Figures at left of chart represent the order of importance of the twelve buying factors—1 being of first importance; 2 of second importance; etc., i.e. the largest number of buyers placed endurance first. Classification by price class

automobile buyers; their thoughts are affected more by present price reductions than by thoroughgoing analyses of the gasoline situation.

The emphasis of speed and power which appears in many advertisements is out of proportion to its importance as estimated by the potential buyers. Speed is tenth in the list of buyers' opinions, while hill climbing is eighth. The buyer knows that he can buy practically any car on the market and be assured of enough power to fill all his ordinary transportation needs. As a result, he subconsciously relegates the power consideration to the background in considering a particular car.

Limited classes of the potential buying market, of

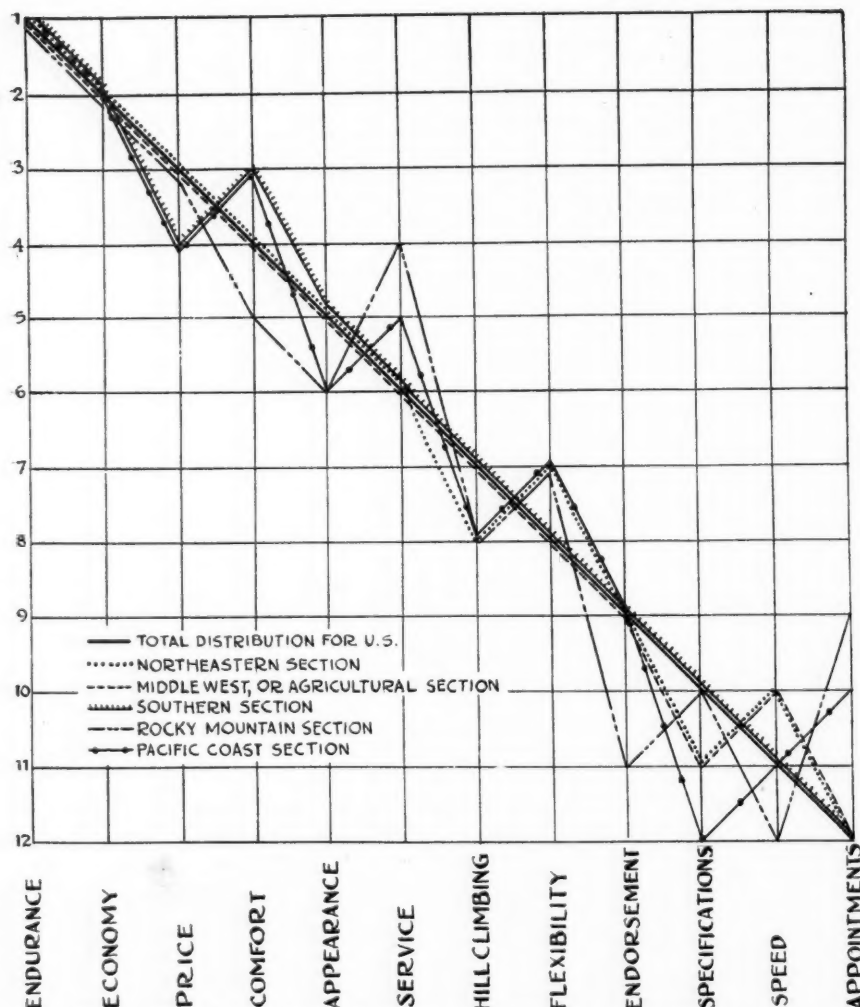


Fig. 2—Figures at left of chart represent the order of importance of the twelve buying factors—1 being of first importance; 2 of second importance; etc., i.e. the largest number of buyers placed endurance first. Classification by geographical sections

course, is specially interested in exceptional speed and power, but the results of this questionnaire indicate very strongly that this class constitutes only a small part of the total of automobile buyers and owners.

That slogans and catch words have very little effect in selling cars is also indicated by the replies. Fifty-one per cent of those replying said they were not interested in slogans, while 40 per cent failed to reply to this part of the questionnaire at all. The other 9 per cent said they were interested in general motor transport slogans, such as "Drive Carefully," etc.

As regards special features, such as engines, axles, etc., 23 per cent expressed interest in such features, while 48 per cent said they were not. Twenty-nine per cent were non-committal.

The reaction of the owner on this point is specially interesting in view of the extended efforts that have been made to "sell" him along this line. The manufacturer and the dealer, of course, are vitally interested in the qualities and characteristics of the different units which make up the finished product, but the average car buyer is interested chiefly in the performance of the finished car. This fact is emphasized by a re-examination of the list for middle-priced cars.

The buyer of this type of car is interested chiefly in endurance, comfort, price and appearance in the order named—and his interest in economy will be a rapidly growing one. All of these factors effect the performance of the finished product.

There are several interesting points in connection with the N. A. C. C. chart shown in Fig. 2. The answers to the questionnaire were divided according to the sections of the country from which they came and the curves drawn accordingly. For the most part there is a striking similarity of opinion recorded from all parts of the country, but a few definite divergences do stand out. The Pacific Coast States, for instance, think more of appearance than of price, an opinion with which the Southern States seem to agree. The buyers in the Northeastern States agree with the general opinion until it comes to flexibility, which they rate above hill-climbing ability. This group also is influenced more by speed than by specifications.

In the case of the Northeastern States, however, the divergence from the average is scarcely marked enough to be of any special significance in any instance.

The relative importance given to service by the Rocky Mountain States, however, is worthy of note. While service stands sixth in the general average, it is considered as fourth in importance by owners in these States. This may be an indication that service is not up to par in this section, and that special efforts should be made along this line. Data of this kind, at any rate, are valuable in planning selling campaigns for specific territories. As accurate information is accumulated along these lines, the cost of merchandising can be ultimately reduced and one of the big factors of sales resistance overcome.

It would be extremely difficult—and perhaps dangerous—to comment upon the low rating given to endorsements of other owners by the people of the Rocky Mountain States. The Rocky Mountain line also takes a startling jump in rating appointments ninth instead of twelfth as does the rest of the country.

While the results of this questionnaire cannot be taken as final and accurate data concerning the points covered, they can well be utilized as a strong indication of which way the wind is blowing. The features of chief interest to the automobile buyer are rather strongly indicated, and the ineffectiveness of certain types of merchandising effort pretty well established as a result of the analysis. Thus the data accumulated from this questionnaire should be of definite sales value to the industry at the present time, if studied carefully and used with a full understanding of the limitations involved in its gathering and compilation.

Moreover, the significance of the survey as an illustration of what may be done along the lines of merchandising research should be fully recognized. Further data of this kind should be accumulated, correlated and analyzed.

Too much cannot be expected within a short time. Rome was not built in a day, nor can the intricate problems of merchandising be completely solved in a short time, since they involve so many intangible, as well as variable, factors. Immediate benefits can be derived from such research which will do far more than pay for the cost of research, while the ultimate benefits to be derived are very great.

Crossley Building Chassis with Smaller Four-Cylinder Engine

225 cu. in. engine has several interesting features. Generator and fan are combined in one unit and driven by V-belt from pulley on magneto drive shaft. Convenient adjustment for both hand and foot brakes.

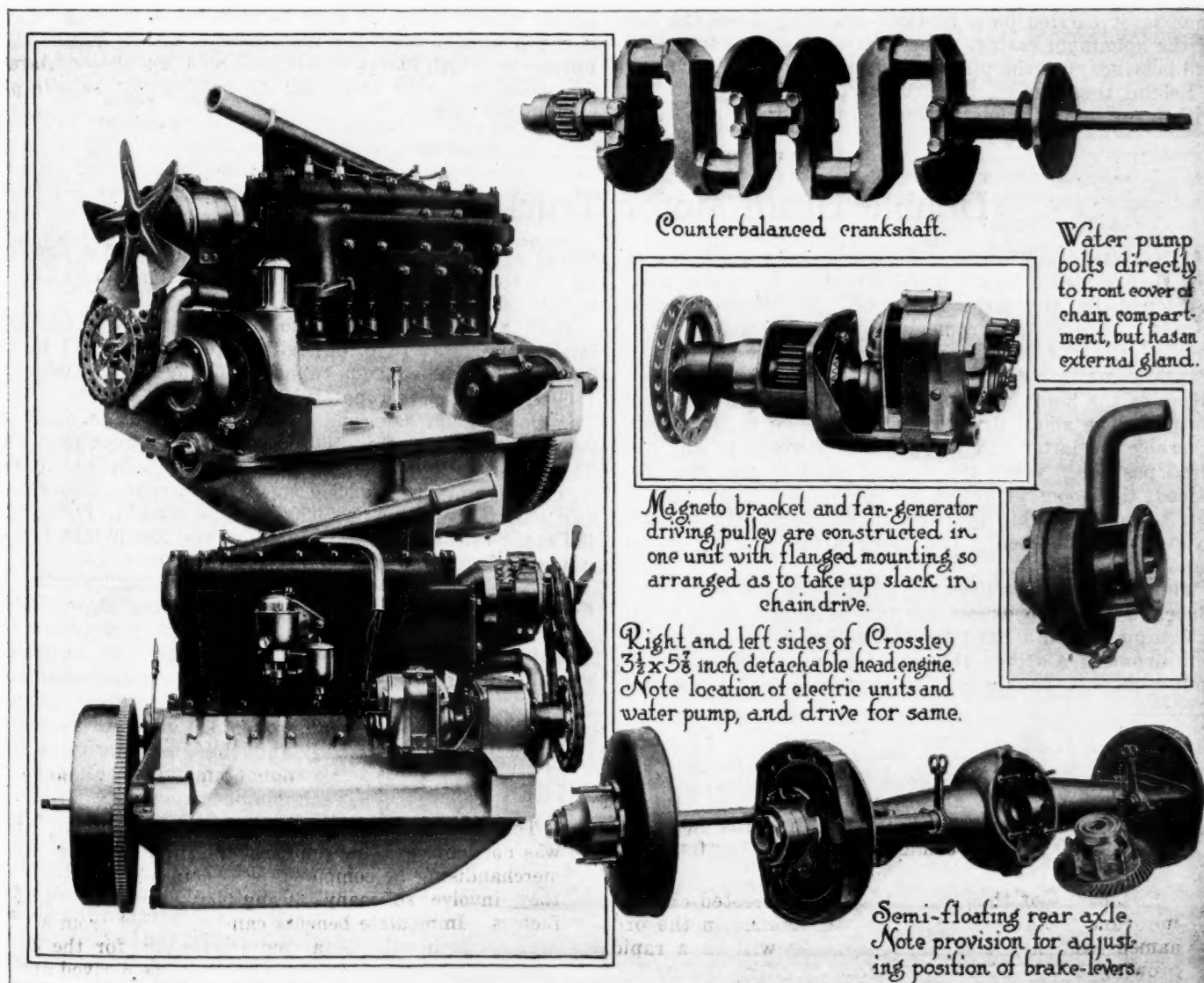
By M. W. Bourdon

CROSSLEY has introduced an entirely new model which is put forward as a lower priced five-passenger to supplement the older four-cylinder chassis, which has a bore and stroke of $4 \times 5\frac{1}{2}$ in. (279 cu. in.) as compared with $3\frac{1}{2} \times 5\frac{7}{8}$ in. of the new engine (225 cu. in.).

The new type has block cast detachable L-head cylinders. The usual head gasket is required to serve as a compression joint only, the water joints being made by double V-section rubber rings which are employed between side

passages formed in head and cylinder block, the bulges in the sides of the castings for this purpose being very slight. The cylinder block is separate from the aluminum crankcase, which is divided at the crankshaft center line, the upper half supporting the three bearing counter weighted shaft and having four point suspension from the main frame with integral webs between the arms to eliminate the need for an underpan.

Hollow shaft lubrication is used with a gear-type pump submerged in the oil in the sump and driven by skew gear-



Counterbalanced crankshaft.

Water pump bolts directly to front cover of chain compartment, but has an external gland.

Magneto bracket and fan-generator driving pulley are constructed in one unit with flanged mounting so arranged as to take up slack in chain drive.

Right and left sides of Crossley $3\frac{1}{2} \times 5\frac{7}{8}$ inch detachable head engine. Note location of electric units and water pump, and drive for same.

Semi-floating rear axle. Note provision for adjusting position of brake-levers.

ing from the camshaft on the left. The latter has an adjustable silent chain drive.

The connecting rods are H-section drop forgings. The hollow wrist pins float in the bosses of the cast iron lanterned pistons and in the rod end. Pump water circulation and a tubular radiator are used. The pump is driven by a forward extension of the camshaft. It is bolted to the front face of the distribution casing, but has an external gland.

On the right of the crankcase is the magneto. Its shaft is also chain driven and has the fan driving pulley at its front end. The magneto bracket, driving shaft, sprocket and fan pulley are mounted as a unit movable laterally for chain adjustment. The fan itself is mounted on the front of the armature shaft of the generator which is arranged high up in front of the cylinder block.

The five-jet Smith carbureter is also on the right, fed by the vacuum system and bolted to the flanged face of a transverse passage leading to a detachable manifold on the left, which is arranged close to but not actually in full contact with the exhaust manifold. The latter has its outlet branch at the front end, the pipe to the muffler passing down vertically through a hole in the crankcase web extensions.

Engine and gear-set are separate units. The latter is supported by a short subframe at four points and is connected to the cone clutch (which has a ball bearing pilot) by a coupling shaft with a pair of flexible disk joints. The gearbox has four speeds and is provided with a right-hand lever carried on a bracket extending from the top of the aluminum casing. The gear shafts are carried on ball bearings, but the pilot bearing is of the roller type.

Behind the gear-set is a contracting shoe type brake with face cam actuation. The drum has attached to it the

casing of the enclosed star universal at the front end of the open propeller shaft. The last named is solid and has a sliding block joint at the rear with renewable steel plates in its casing, the phosphor bronze blocks being backed by springs to prevent rattle.

The back axle is a steel casting with integral taper extensions. The detachable rear plate allows the spiral bevel gearing to be easily withdrawn when the driving shafts have been removed. The final drive ratio is 3.57 to 1. Drums for the expanding rear brakes have pressed steel hollow spoked detachable wheels attached to them on the semi-floating axle ends, the hubs running on parallel roller bearings with thrust races. Ball bearings are used to carry the differential. The brake camshafts at their inner ends have side-toothed plates attached to them, engaging with actuating levers having similar teeth at one side of their bosses, this arrangement allowing the angle of the levers to be reset as brake wear occurs, though a service wing-nut adjustment is provided at the ends of the pull rods.

Semi-elliptic springs are used back and front. The worm and complete wheel steering gear has its worm shaft mounted on eccentric bushes for mesh adjustment. Parallel roller bearings and ball thrust races are used for the front hubs, and ball bearings for the swivel pins. Oil cups are used throughout in lieu of grease cups.

The chassis weight is 2070 lb., the wheelbase is 124 in., and the track 55 in. Normal British practice is followed, though in detail it is more of a production job than the larger model which, it may be said, is a pre-war type modified first to meet the requirements of the Royal Air Force—by which it was widely used as a tender—and then remodeled for 1919 and 1920 as a five-seven passenger private car chassis.

Double Drum Motor Truck Power Winch

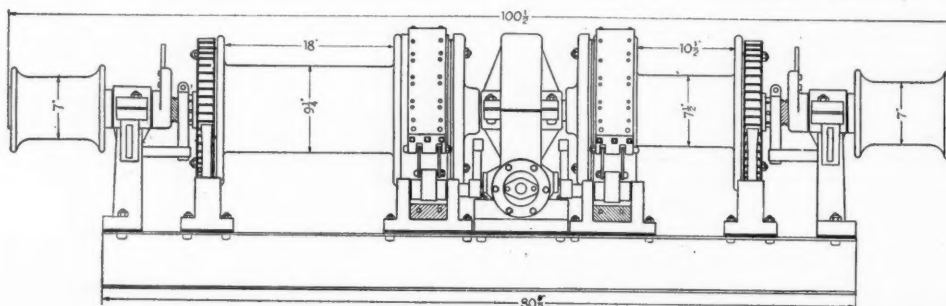
A MOTOR truck winch designed to take the place of heavy steam hoists in construction work has been developed by the Erie Hoist Co. It comprises two winches on a single frame, with a single drive shaft. The winch is driven from the power take-off on the transmission by means of a chain and sprockets. Installation of the hoist back of the cab is said to be an easy matter. The small drum rope is fastened to the boom, whereby the latter can be raised or lowered to any desired position. When the desired position has been attained, the boom is locked by the ratchet pawl, and it can be held in this position indefinitely with perfect safety, it is claimed. The large drum line serves to handle the load.

This winch can be used for hoisting or pulling in two places, as the two drums are independent. Each drum is equipped with a band brake, ratchet wheel and pawl. The drums are driven through friction clutches of the cone type with double friction surfaces. The worm and

wheel are inclosed in a dust-proof housing and run in oil. A three-speed and reverse transmission can be fitted to this outfit, giving three additional speeds.

With a gear ratio of 42 to 1 the rope speed on the large drum is 34 ft. p. m.; with a gear ratio of 21 to 1, 68 ft. p. m. The drum capacity of the large drum is 1500 ft. $\frac{3}{8}$ -in. wire rope; 1000 ft. $\frac{7}{16}$ -in.; 900 ft. $\frac{1}{2}$ -in. The small drum has rope speeds of 30 ft. p. m. with a gear ratio of 42 to 1 and 60 ft. p. m. with a gear ratio of 21 to 1; its rope capacity is 1100 ft. of $\frac{3}{8}$ -in. rope, 850 ft. of $\frac{7}{16}$ -in. rope and 650 ft. of $\frac{1}{2}$ -in. rope. The rope pull of a single line is 7000 lb.; the weight, 1725 lb.; the space back of the seat, $19\frac{1}{2}$ in., and the height from center of drum shaft to chassis, 19 in.

THE two following publications of the Bureau of Standards, Washington, D. C., have just been released for general distribution: Circular 100, entitled "Nickel," contains 106 pages in which are included an account of the metallurgy, physical properties, effect of impurities, and the characteristics of the commercial alloys of nickel; Technologic paper 188 entitled "White Metal Bearing Alloys at Elevated Temperatures" describes the results of an investigation on bearing metal alloys of particular interest in the automotive industry, the temperatures considered in this investigation running up to 100 deg. C.



A double drum winch for motor trucks

Some Factors Affecting Carbureter Design and Operation

Deductions drawn by a carbureter designer from the results of tests conducted by O. C. Berry at Purdue University, lay stress upon need for enriching the mixture as throttle closes and load decreases.

By W. H. Weber*

A FEW years ago Prof. O. C. Berry of Purdue University conducted a series of tests on "Mixture Requirements for Automobile Engines," the results of which are extremely interesting and important to carbureter designers. Although the results of these tests are not given in the most desirable form for the prospective designer, yet many valuable conclusions may be drawn from them. In fact, it is possible to design an efficient instrument from a serious study of mixture requirements.

Carbureter literature in general is not very enlightening. We are told by the makers that the law of liquid flow prevents the use of the combination of the simple suction controlled fuel and air jets, for the reason that the fuel flows faster in proportion to the air as the suction increases. We are further told of the successful manner in which each manufacturer overcomes this tendency through his special device, the inference being that the perfect carbureter is an instrument which will deliver a constant proportion of fuel and air under all conditions. As a matter of fact, this latter is not true.

There is a certain definite field which represents all conditions which a carbureter must meet. We may indicate the limits of this field by the graph, Fig. 1, in which the line OY represents the load carried from nothing to maximum and the line OX represents the engine speed, also from zero to maximum. The field formed, OYZX, embraces all conditions under which an engine may operate. It is this field which Professor Berry has very conscientiously covered. His tests may be briefly given in résumé thus:

1. Determination of best mixture at 1000 r.p.m., half load, for (a) best power; (b) best thermal efficiency.

*Engineer, Claudel Carbureter Co.

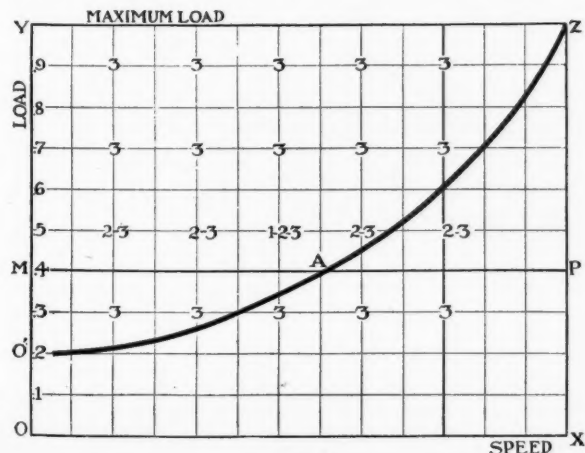


Fig. 1

Results: Best power secured with .0775 lb. fuel per pound air; best efficiency secured with .063 lb. fuel per pound air. This test considered but one point in the field is marked 1.

2. Effect of speed on mixture requirements at half load, for (a) best power; (b) best thermal efficiency. Results: Best power secured with .0775 lb. fuel per pound air; best efficiency secured with .063 lb. fuel per pound air. The points considered in this test are marked 2.

3. Effect of load on mixture requirements at various speeds, for (a) best power; (b) best thermal efficiency. Results: Best power secured with .0775 lb. fuel per pound air; best efficiency secured with .0775 lb. fuel per pound air, at light loads; .062 lb. at heavy loads.

From test No. 3 we may immediately draw the following conclusions:

First—No fixed air, fixed fuel carbureter can be adjusted to deliver maximum power and operate at maximum thermal efficiency with the same setting.

Second—If such a carbureter be adjusted for maximum efficiency, some extra means must be taken to enrich the mixture for light loads.

Before laying down any rules for carbureter construction let us consider an actual engine in a passenger car. The maximum possible load is represented by the line XZ (Fig. 1). Points along this line will, of course, have different values dependent entirely upon the load the engine can carry at various speeds. Furthermore, this line must represent the maximum possible boundary within which the carbureter must function and is obtained with wide-open throttle, mixture adjusted for best power at all speeds. It is obvious, however, that the engine is not always operating under such conditions in the passenger car; as a matter of fact, we only touch this line when we want a maximum of some sort, such as quick acceleration, heavy pull, high speed, etc. If we now calculate the power necessary to propel the vehicle in which the engine is placed, along a level road with minimum resistance from lowest to highest speed, we can find the load necessary under this condition and plot it in Fig. 1, such as line O'Z. O'Z will then represent the low boundary within which the carbureter must function. Any point in the field below O'Z need not be considered, since the power developed at such a point is not sufficient to produce vehicular motion at that engine speed. We now have a new field, O'ZX, for carbureter consideration.

Professor Berry's test, marked 3, tells us that maximum thermal efficiency requires .0775 lb. fuel per pound of air under light loads and .062 lb. fuel per pound of air under heavy loads; we may draw an arbitrary line, MAP, dividing the field as shown, the region below MAP

representing light loads and above MAP heavy loads. The area O'AM, then, represents that section in which maximum efficiency accompanies .0775 lb. fuel per pound of air, and the area MAZY the section in which maximum thermal efficiency accompanies .063 lb. fuel per pound of air, and the combined area, O'AZYM, that section in which maximum power accompanies .0775 lb. fuel per pound of air. We need not consider the actual figures .063 and .0775, but rather their relation to each other to the extent that one helps to make a lean and efficient mixture, whereas the other helps to make a rich and powerful mixture. Different gear ratios will affect the curve, O'AZ, to the extent that A will move toward M when we lower the ratio or toward P when we increase the ratio, the point being that we need consider only a small part of the field OXPAM.

The following general statements regarding carbureters in actual use may be made: First, during much the greater part of his driving time the car owner is operating his car with the throttle not wide open. The throttle opening scarcely exceeds one-half of the maximum open position. Second, when the driver opens his throttle wide, he does so for a maximum: Maximum speed, maximum power on hills, maximum acceleration from low speeds, etc. Third, he wants good gasoline economy at all times, but he is willing to sacrifice a little in economy for the sake of maximum power during the small portion of time he demands power. On the other hand, during the greater part of his driving he is using only partial throttle opening, and he is willing to sacrifice a little power which he will never miss. These generalizations are rational and allow us to lay down some definite requirements for a carbureter which

will be a so-called "maximum" instrument in so far as we can mechanically make it so.

The fixed air, fixed fuel carbureter may be adjusted for either maximum efficiency or power or for a mean, but never for both extremes. We may then lay down the rule that to make as nearly perfect a carbureter as possible we must start with an instrument capable of delivering a constant mixture of fuel and air at all engine suction. This carbureter will satisfy either maximum efficiency or maximum power conditions in the field MAZY. A fuel jet placed near the throttle—such as an idling jet—so arranged that its flow will gradually diminish as the throttle is opened, will take care of the field O'AM when the carbureter is adjusted for maximum efficiency. Finally, it is desirable to add a mixture quality control to remain fixed for either of two conditions—namely, variable throttle and wide-open throttle. In operation we will be then able to obtain the following results:

Variable throttle (average driving) carbureter adjusted for maximum efficiency. When throttle is in idling position, mixture is enriched by idling jet. As throttle is gradually opened, mixture thins out until point A is reached, when mixture becomes constant until throttle is nearly wide open. The point at which idling jet cuts out may be varied to suit different engines, depending upon the position of point A.

Wide-open or nearly wide-open throttle (maximum demands), carbureter automatically becomes adjusted for maximum power. Idling jet is not in operation, and, since carbureter is capable of delivering a constant ratio of fuel and air, mixture will be set for maximum power throughout the entire range of speed.

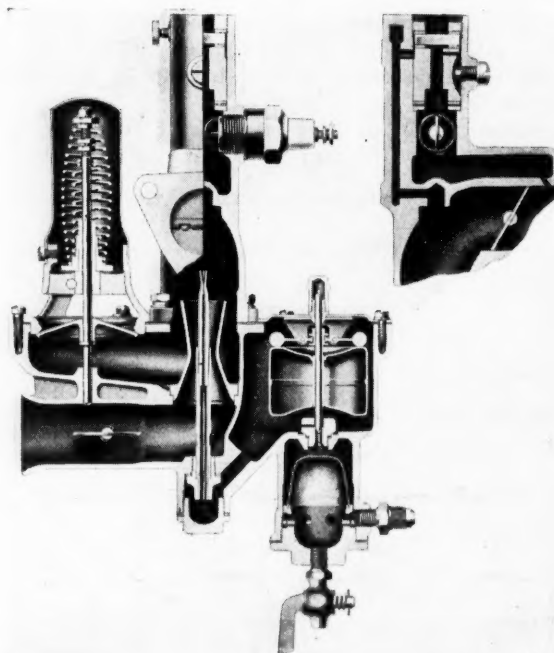
Improved Carbureter on Packard Cars

THE Packard single sixes are now coming through with a two-range or double jet carbureter. Used in combination with the fuelizer, it is claimed that this carbureter greatly increases the gasoline mileage possible with the single six cars. The carbureter is designed to give automatically a mixture to suit the needs of either heavy or light pulling. The new two-stage carbureter is being supplied on all the single sixes at present, and is being provided without charge as rapidly as possible for cars already in service.

The two-stage jet carbureter is designed to give a rich mixture when it is needed and a leaner mixture for ordinary driving. This is accomplished by having two jets. The one for the richer mixture is placed so far above the float chamber level and the throat of the venturi that it will not work during ordinary running, but will respond to high suction from the engine which is created by a heavy pull. Referring to the sectional view of the carbureter herewith, the main jet used for general driving is the annular passage located at the throat of the venturi. The secondary jet is the central tube which extends upward into the mixing chamber of the carbureter above the venturi. This being away from the venturi, naturally the velocity head around it is considerably lower, and consequently the jet is not in operation at ordinary speeds. Furthermore, the jet being considerably above the level of gasoline in the float chamber, it is necessary for considerable pull to be exerted to lift the gasoline from this jet.

When a high vacuum exists in the mixing chamber, as, for instance, when the engine is pulling heavily, or when the velocity head increases to a high degree due to running at extreme throttle openings on a level road, the secondary jet will cut in. It is claimed that a considerable

saving in fuel is effected by the use of this carbureter, and in the testing room at the Packard plant, no engines are being passed until they can show an economy equivalent to 20 miles to the gallon under favorable conditions. The Packard fuelizer, which is put out as standard equipment, is an integral part of this new carbureter.



Sectional views of improved two-stage carbureter used on Packard single six engine

A French Twin-Engined Armored Biplane

Lioré & Oliver plane is designed to protect pilot and gunners but is relatively light and maneuverable. Rotary engines and duralumin fuselage are employed. Can be operated with one engine disabled.

By John Jay Ide

IN designing the Lioré & Oliver armored biplane the principal purpose of the constructors was to fill the need for an airplane that was properly armored and at the same time light and maneuverable. It was not possible to inclose all vital parts in armor, as this would have resulted in a very heavy machine having a ceiling of about 5000 ft. and poor control. The designers were content to protect the pilot and gunner with armor and to use Lanser leak-proof fuel tanks. Rotary engines were adopted on account of the fact that during the war they had made the reputation of running even when hit by bullets.

The fuselage, which is of rectangular section, is constructed entirely of duralumin. A series of tubes forming Warren trusses is riveted to the longerons of the fuselage. The fuselage is calculated to withstand six times the normal load.

The pilot and gunner, who are in one compartment, are protected by steel plates 0.276 in. in thickness, riveted together. The weight of the armor alone is 661 lb. The gunner can either remain in his gun ring or seat himself behind the pilot and take control of the machine. To facilitate this the gun ring is mounted on slides and can be moved backward.

The engines are supplied from a main tank having a capacity of 72 gal., mounted in the nose of the fuselage, and by two gravity tanks in the top wing. All tanks are leak-proof. There is a pump for each of the gravity tanks. If one pump is damaged the other pump can be used for supplying both tanks by turning a tap in the pilot's cockpit. If both pumps should be put out of action the gravity tanks contain enough fuel for half an hour's flight.

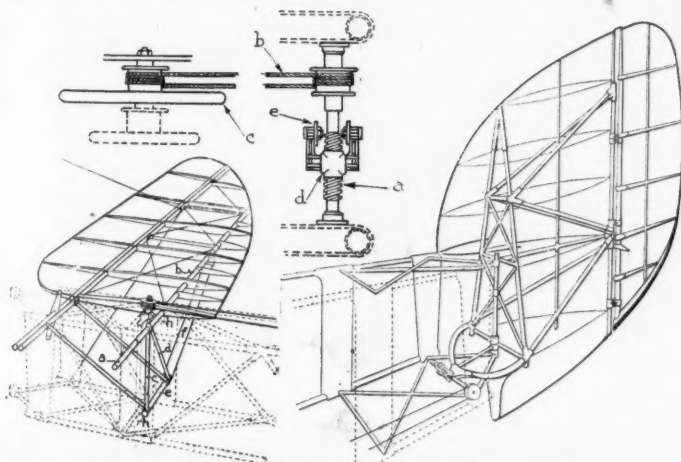


Diagram showing construction and control device for stabilizer and pivoted stern structure and control mechanism of Lioré & Oliver biplane

A nine-cylinder 180-hp. Le Rhone rotary engine is mounted in a streamline nacelle on each side of the central fuselage. A fairing incases the central part of each propeller and masks most of the engine. Cooling is effected by an opening in the nose of the fairing, which permits air to enter and cool the crankcase and cylinder bases. The exit for the air is past the cylinder heads and also out of the tail of the nacelle. Each engine is held in place by duralumin tubes attached to the interplane struts and landing gear.

The method of truing up the wings is rather ingenious. At the base of each strut there is a system of double



The Lioré & Oliver armored biplane equipped with two nine-cylinder Le Rhone engines of 180 hp. each

screws with opposite threads so that adjustments can be made without any disassembling.

In the ordinary twin engine aeroplane having one power unit on each side of the center line, the stoppage of one engine necessitates holding the rudder hard over in order to keep on a straight course, granting that the machine can fly at all on one engine. In the Lioré & Oliver the angle of the fin is adjustable with reference to the longitudinal axis of the machine. This is accomplished by pivoting the whole stern of the fuselage. As shown in a sketch herewith there is a screw (a) controlled by a cable (b) and a handwheel (c). On this screw moves a bronze nut (d) integral with the fork (e), which forms part of the fin structure. In general a jointed tail does not inspire one with confidence, but in this case the fin has resisted a load twelve times normal.

The stabilizer has a variable angle of incidence and is controlled by a cable and handwheel in a similar manner to the fin. Referring to the sketch, the two halves of the stabilizer (a) and (b), connected by means of a sleeve and conical pins, form with the two tubes (c) and (d), the cross piece (e) and the two tubes (f) and (g) an absolutely rigid structure. The movement of the stabilizer is limited by the slides (h) riveted to the sides of the fuselage longerons. The variable angle of inci-

dence stabilizer allows the pilot to adjust the angle according to the load. The tail can even be made slightly lifting without danger as the pilot can always bring it back to 0 deg., or to a negative angle if the airplane glides too steeply.

The landing gear has been designed to have the least possible head resistance. Each wheel with its shock absorber is covered by a cowling and the axle is used as a spar for a small wing. The axle is composed of two forks, one sliding within the other. Each wheel cowling forms a mudguard and is quickly removable.

The skid has been designed to avoid fuselage strain. The vertical and horizontal stresses are absorbed by springs in a piston placed in the direction of the resultant of the stresses. The transverse stresses are taken up by leaf springs fixed to the stern of the fuselage to which the piston is attached.

The characteristics of the machine are:

Span	47.1 ft.
Length	27.2 ft.
Height	11.0 ft.
Wing area	509 sq. ft.

Stagger of upper wing.....	2.1 ft.
Wheel track	13.8 ft.
Weight empty	2,866 lb.
Useful load	1,322 lb.
Total weight	4,188 lb.
Total horsepower	360
Weight per sq. ft.....	8.2 lb.
Weight per horsepower.....	11.6 lb.
Speed at ground level.....	114 m.p.h.
Speed at 9,840 ft.....	108 m.p.h.
Climb to 3,280 ft.....	4 min.
Climb to 6,560 ft.....	8 min.
Climb to 16,400 ft.....	39 min.
Service ceiling	18,040 ft.
Theoretical ceiling	19,680 ft.

With one engine the machine has made a series of figure eight turns without losing height. In this test the full load of 1322 lb. was carried and a horizontal speed of 62 m.p.h. was made.

Without armor the useful load can be increased from 1322 to 1984 lb. That is 47 per cent of the total weight, a high figure for an airplane of this type.

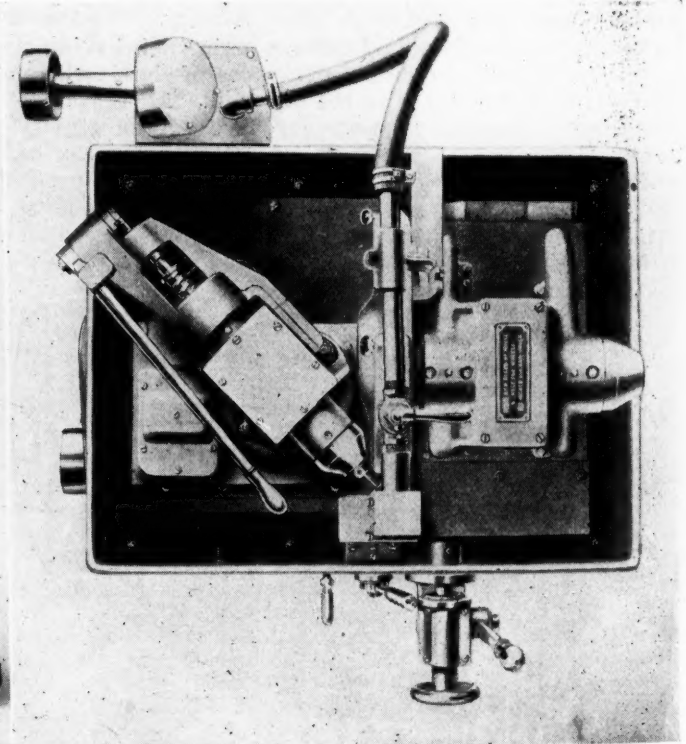
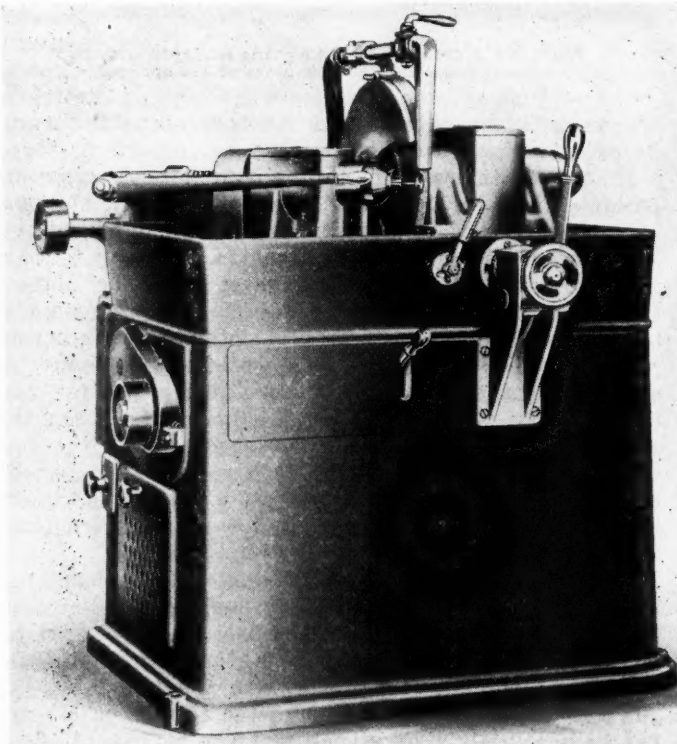
Poppet Valve Seat Grinding Machine

THE accompanying photographs show two views of a new grinding machine arranged for grinding the seats of poppet valves. The valves are held by a collet chuck which is operated by the lever shown at the side of the work head. The machine can also be furnished with a work head for grinding valve seats on centers. The work head can be set at any angle, to suit the angle of the valves to be ground, and has an automatic movement parallel to the wheel spindle, which can be set to move the required distance for the valve being ground.

The wheel head has a cross movement and is operated by the vertical lever directly in front of it. The hand wheel on the cam bracket is for taking care of the wear

of the wheel. It is provided with a micrometer reading. The lever to the left is for operating the diamond tool for truing the wheel; the lower lever to the left of the cross feed bracket is for stopping and starting the work head. A 3-hp. motor in the base of the machine furnishes the power. The weight of the machine, including the motor, is approximately 2500 lb.

The general construction of this machine is such that it can be arranged for grinding a large variety of small parts in factories where large production is required and the machine can be kept busy on one particular part. The machine is manufactured by the Fitchburg Grinding Machine Co.



Side and top views of Fitchburg valve grinding machine

Adjustable Spring Shackles Take Up Wear and Prevent Rattle

Two methods employed by well known car manufacturers prevent noise which otherwise occurs when spring shackles become worn. In one case a coil spring automatically takes up side play and in the other an adjustable threaded collar enables convenient hand adjustment.

By J. Edward Schipper

A POINT which the majority of designers have overlooked is proper provision against rattle of spring shackle bolts. Experience has shown that on the majority of cars the first point at which rattle begins is the shackle bolt. This is particularly noticeable in a great many cars with the Hotchkiss drive, wear resulting in rattle begins at the spring pivot bolts in the front end of the rear spring.

This bolt receives stresses of a nature which are comparable in some ways to the stresses on the piston pin. It is an oscillating bearing subjected to shock as well as to static load, and consequently subject to rapid wear unless adequately lubricated. The road shocks are transmitted directly to this bolt, and wear is also caused by oscillation due to the deflection of the rear spring. The torque, due to braking the car, and as well as to acceleration, is also absorbed in the Hotchkiss drive through the bolt at the front end of the rear spring.

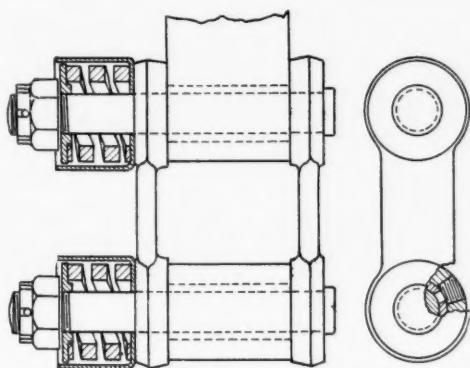
It is true that the oil cups, or grease cups, or pressure lubricating attachments now employed as stock equipment on up-to-date cars are more accessible at this point than they were in previous years, but even so it is unusual for this bearing to receive proper attention from the owner, consequently it is sure to be one of the most rapid wearing parts on the chassis, and bound to develop a rattle which is especially noticeable over cobble or wood block roads, or other surface which causes numerous small oscillations in the springs.

There are two ways of preventing rattle. One is by a method which automatically compensates for wear, and the other is by making the bearing adjustable. The

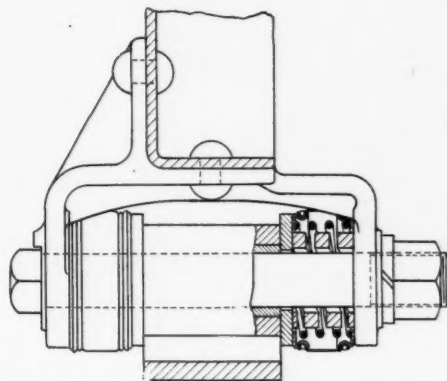
Jordan Motor Car Co. has adopted a method by which the shackle bolts are put under considerable spring pressure, thus automatically taking up wear which takes place between the sides of the shackle and the end of the spring eye or shackle bushing. Experimental cars have been driven in the neighborhood of 50,000 miles with this spring device without developing any rattles. The device was first incorporated on the front end of the rear spring where, due to the higher stresses of torque as well as suspension, wear was bound to develop. This proved to be so successful at this point that it has now been adopted for the rear shackles also.

The assembly at the rear spring front bracket differs somewhat in detail from the rear shackle assembly, although identical in principle. Drawings of each installation are shown herewith. A heavy coil spring of 250 lb. tension is fitted between the brackets and the bearing. This is contained in a cup or boot. The earlier installations were housed in a leather boot, but a metal cup has now been substituted. The drawing of the front bracket assembly shows a leather boot construction with a light spring to hold the boot in position. The rear installation has a metal cup, which acts as a dust housing and grease container.

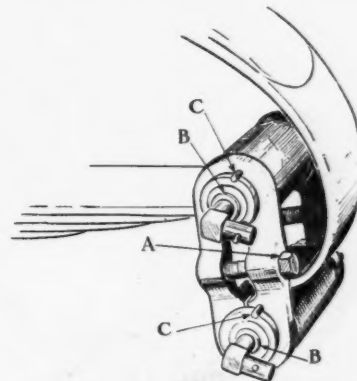
On the front bracket assembly, springs are mounted on each side of the center line, while in the rear the springs are on one side only. This type of installation was made on a trial basis, as it was thought that the spring pressure might cause excess wear rather than prevent it. It has been found, however, that after running the chassis over thousands of miles of all kinds



Rear spring rear shackle assembly on the Jordan car, showing the coil spring installation for taking up wear and preventing rattles



Rear spring front bracket assembly in the Jordan car, showing the eye of the leaf spring between the two 250-lb. coil springs



Adjustable shackle on the Locomobile car. This clamp screw A is loosened and the adjusting washers B can be turned up. These are prevented from turning by the locking pins C

of roads, it has been impossible to detect wear. The coil springs are all interchangeable and are ground to a flat surface for good contact all around.

On the Locomobile car an adjustable collar, which is held in place by a clamp screw, is employed. When wear has occurred in the shackles with this arrangement adjustment can be made by loosening the clamp screw and turning up a threaded collar to another stop on a locking pin, which holds the collar in place and prevents it from rotating. The clamp screw is then tightened, locking the adjustment in place. This brings a new wearing surface into play and brings the shackle into closer contact with the end of the spring acting in a similar way to the coil spring utilized on the Jordan installation.

It is interesting to note the thought that is being given these detail parts, as it is a regrettable fact that we have not been up to European practice in this respect. American design has caught up to and passed European in a great many of the essential features of motor car design at the present time. This has been particularly true of

progress made since 1915, and if serious attention is going to be given to these detailed features, which have a great deal to do, not only with the life of the car, but the comfort of the owner, another step forward will have been made.

There are a number of these small points about the chassis which can be given attention with remarkably welcome results. The small item of spring shackle wear is only a minor problem as compared to many which have been solved, and yet, when no attention is given to this detail, the car is likely to become noisy after 5,000 or 6,000 miles. In some makes of cars it has become noticeable that spring shackle rattles occur after the first three or four thousand miles of driving, and there is no means whatever of removing the rattles except by rebushing the shackles and probably fitting new shackle bolts.

With the self-lubricating bushings employed in the spring shackles by many manufacturers, some adjustable or compensating device for maintaining tightness at this point will prove a valuable addition.

A Straddle Milling Machine for Facing Crankshaft Bearings

THE accompanying illustrations show a specialized type of machine for facing the crankshaft bearings of engine crankcases and at the same time milling the oil slinger groove. The bearing caps are removed while this operation is going on. The machine is of the rise-and-fall table type, being loaded and unloaded while at the top of the stroke, when it is in line with the conveyor system. The table is provided with hardened steel jib plates and with locating pins which are raised and lowered by the lever seen in front of machine, so that there is no obstruction to the free entrance and removal of the casting, clamping being done by the hand wheel clamps illustrated.

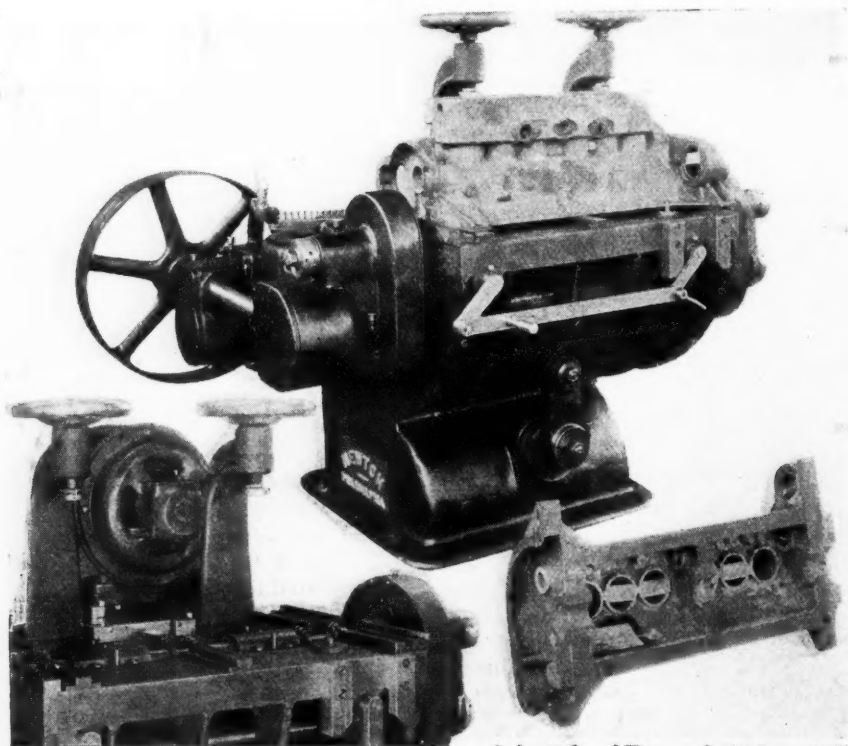
The cutter mandrel is driven from both ends and supported by bearings between cutters. The table is raised

and lowered by a cam providing slow feed and quick return.

The casting illustrated required eight cutters, all three bearings faced being machined on both sides, and there being an additional cutter for oil slinger groove and a small cutter for finishing the bore of the oil slinger groove. The production of the machine is 25 pieces per hour.

A larger machine of the same general construction is used for the same operation except with the caps in place. Spacing collars to give a variation of 0.002 in. are provided to hold the dimensions of the cutters. Provision is also made so that the rate of feed can be changed according to the use of the machine for cast iron or aluminum.

The straddle milling machine above described is manufactured by the Newton Machine & Tool Works.



Newton straddle milling machine for facing off ends of crankshaft bearings.

A New Assembled Truck

THE Independent Motor Co. has brought out a new line of three trucks rated at 1½, 2½ and 3½ tons capacity. These trucks are all equipped with standard units including the Continental engine, Zenith carburetor, Eise-mann magneto, Fuller transmission, Ross steering gear, etc. The axles are Shuler in front and Timken rear for the two smaller types and Wisconsin rear on the 3½ ton. All of these trucks are worm driven and the present line is the result of developments by this concern since 1911. The engine sizes are 3¾ x 5 on the 1½; 4½ x 5¼ on the 2½ and 4½ x 5½ on the 3½ ton truck.

The trucks are supplied in chassis form only, the body equipment being optional and extra. The wheelbases for the three models are 148 in. and 160 in. The chassis are all of semi-flexible pressed steel construction with rigid cross-members. The trucks are designed to fill a wide range of transportation service and are being put out by this concern as suitable for mercantile, farming or manufacturing lines.

The Development of the Roller Chain Drive

An outline of changes which have taken place in the design and construction of chains and sprockets, with special reference to standardization of the roller chain and of a new form of roller chain sprocket tooth which has many advantages over tooth forms employed heretofore.

By G. M. Bartlett*

THERE was a time when gear teeth were nothing but "cogs" of indefinite form, and the fact that it was desirable to give them a particular shape in order to decrease the noise and increase their wearing qualities, was realized by only a few. It was many years before engineers and university professors discovered that the problems of odotics were of a high order, and well worth the attention of the keenest minds. When such men as Willis, Herrmann, Olivier, McCord, Bilgren and Lewis devoted themselves to this science the result was a succession of advances in the theory and practice of gear design and gear cutting machines which have played a most important part in mechanical history during the last half century. Gear teeth are no longer mere "cogs." Their outlines are curves mathematically determined and accurately cut by highly specialized machine tools; and many a genius has burned the midnight oil pondering over the fascinating problems that have presented themselves in this field.

The roller chain drive is a comparatively new mechanism and is still in its infancy. The exploration of the field of its possible applications has scarcely begun. A scientific study of the kinematics and dynamics of the chain drive has been pursued by but few men up to the present time. The literature on the subject is very meager, and while it cannot be said that the problems yet to be solved in the design of sprockets are of the same nature or as varied as those connected with gearing, they are as real, and they certainly require a type of analytical mind found more often among university professors than among practical engineers.

The chain drive belongs to that class of mechanical movements known as power transmission machinery, and it belongs to that particular sub-class designed to transmit power between two *rotating shafts*, and to that still more restricted sub-class confined to the transmission of power between two parallel rotating shafts. In accomplishing this result it is usually desired that the angular velocity ratio shall be maintained as nearly constant as possible.

The problems of transmitting power between two parallel rotating shafts and maintaining a uniform angular velocity ratio has been solved in four ways: (1) by the parallel crank mechanism, as in locomotive drives, (2) by flexible belt drives, (3) by spur gears, and (4) by chain drives. The parallel crank mechanism is applicable only to cases where the velocity ratio is 1:1.

The belt drive is applicable to cases where the center

distance is necessarily great, where noise is objectionable, and where a positive drive is either not necessary or not desirable. The spur gear drive is applicable to cases where the center distance is short, and where a positive drive and a very close approximation to a uniform angular velocity ratio is desired.

The chain drive is applicable to a variety of center distances between that required by spur gears and that required by a belt drive. It may be as noisy as gears or as quiet as a leather belt drive, depending upon the installation, the speed, and the type of chain used. The angular velocity ratio is constant for entire revolutions, and for parts of a revolution corresponding to the passage of a whole number of teeth; but there is usually a slight deviation from uniformity during the passage of a single tooth. The one exception to this being the case where the velocity ratio is 1:1, and the center distance is an exact multiple of the pitch. While it is desirable that sprockets should be in accurate alignment the drive will perform very satisfactory service when the two sprockets do not lie exactly in the same plane. Advantage has been taken of this flexible feature in connection with final drives for trucks and tractors, and formerly for passenger automobiles, where the chain accommodates itself very nicely to the sprocket misalignments which vary with the contour of the road or of the plowed field.

The action of a chain and sprocket is not like that of an ordinary belt and pulley. But if we conceive the pulley to be a polygon with as many sides as there are teeth in the sprocket, the comparison will be more nearly correct. The action of a chain as it travels over a sprocket with 8 teeth may be compared with the action of a non-slipable belt traveling over an eight sided prism. The action would not be as smooth as if the prism had 16 sides, nor would the action about a 16 sided prism be as smooth as that about a 40 sided one. This is the reason that sprockets with less than 12 or 14 teeth are usually discouraged by chain drive engineers.

The conditions which cause fluctuations in angular velocity are illustrated in Figs. 1 and 2; and the remedy is shown in Fig. 3, where the center distance has been so adjusted as to cause the rollers A and B at the two ends of the straight portion of the chain to rise and fall in unison. This condition may be stated as follows:

Maximum uniformity in angular motion, and hence maximum efficiency, requires that the span of the tight side of a chain must be an exact multiple of the pitch.

Actual efficiency tests have shown that in a drive in which 14 toothed sprockets were used the efficiency was increased 5.6 per cent by changing from 30 $\frac{3}{4}$ in. centers to 30 in. centers, the pitch being 1 $\frac{1}{4}$ in. The same experi-

*Slightly condensed from a paper presented at the Fifth Annual Meeting of the Gear Manufacturers' Association. The author is connected with the Diamond Chain & Mfg. Co.

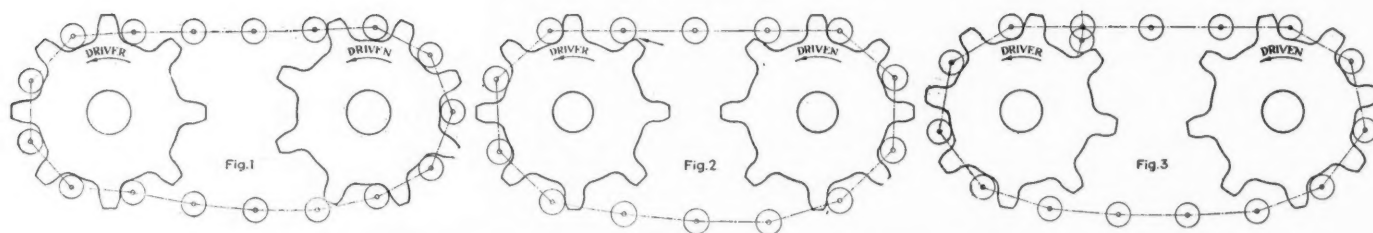


Fig. 1—Old tooth form. Pitch of chain too small. Proper action on follower impossible. Pitch line clearance greater than necessary for driver. Fig. 2—Old tooth form. Chain pitch length too great. Clearance not sufficient. Fig. 3—Old tooth form. Chain elongated. Clearance ample. When roller No. 1 is released No. 2 comes against the tooth with a snap. The motion of the sprocket will be jerky

ment performed with sprockets having 64 teeth showed an increase in efficiency of one-half of 1 per cent.

The following table shows the variations in angular velocity for various combinations of teeth and indicates the importance of avoiding sprockets with a low number of teeth as well as the effect of an adjustment of center distance:

Per Cent Variation of Angular Velocity with Change in Number of Teeth on Driving Sprocket

Teeth on Driven Sprocket	6	9	14	21	30	45
6	00.0 33.3					
9	8.5 22.9	00.0 13.2				
14	12.6 18.4	3.7 9.1	0.0 5.2			
21	14.3 16.6	5.3 7.5	1.5 3.6	0.0 2.0		
30	14.8 16.1	5.8 7.0	2.0 3.1	0.4 1.5	0.0 1.1	
45	15.2 15.7	6.2 6.7	2.3 2.8	0.7 1.3	0.3 0.8	0.0 0.5

The upper figure represents the percentage of variation in the angular velocity of the driven wheel when the span of the chain is an exact multiple of the pitch. The lower figure represents the percentage of variation when the span is an odd multiple of one-half the pitch.

Formula:

For upper figures—

$$100 \left\{ \frac{\cos \frac{180^\circ}{N}}{\cos \frac{180^\circ}{n}} - 1 \right\}$$

For lower figures—

$$100 \left\{ \frac{1}{\cos \frac{180^\circ}{N} \times \cos \frac{180^\circ}{n}} - 1 \right\}$$

Another method which has been used to counteract the variations in angular velocity due to a low number of teeth is the use of the so-called "equalizing gears" which consist of an elliptic pinion driving a gear whose pitch line contains as many waves as there are teeth in the attached sprocket.

Hans Renold of Manchester, England, is probably the father of the chain drive and the Nestor among chain manufacturers. So far as we are able to learn the first practical application of the chain drive was to the propulsion of bicycles and tricycles; and the first factory for the manufacture of chains was built in 1879 by Hans Renold at about the time the so-called "safety" bicycle began to supersede the high wheel. The type of chain then used, and still used to-day to some extent, was the *block center type*, consisting of a series of "B" shaped blocks which form the center links of the chain, these blocks articulating with side links by means of pins passing through holes in the blocks, and riveted to the side plates.

This chain was modified at a later date by substituting two rollers and two bushings for the solid center-blocks, thus forming a *twin roller chain* which could operate over the same sprockets, and which has been supposed to be

much more efficient than the solid block type.

The *standard type of roller chain* as used to-day differs from the twin roller type in that the pitch of the inside links is the same as that of the outside links, instead of being related as 6:4.

This allows a sprocket tooth for every chain link instead of one tooth for every two links, and the action is somewhat smoother.

In adapting the roller chain to drives other than the bicycle it is necessary to make a decided advance in design in order to meet the new requirements with respect to load carrying capacity and high speed. Parts had to be greatly strengthened without an undue increase in weight. This necessitated the use of alloy steel in pins; and where special conditions require it, as in the motorcycle, alloy steel is also used for rollers and side plates. The motorcycle chain is now the most highly specialized and the most carefully designed of all types of roller chains; the reason being that the power to be transmitted requires a very strong chain, while the high speed forbids a heavy chain. It is necessary then to keep the tensile strength high, the pitch short, and the weight low.

In the early years of the passenger automobile many cars were chain driven, and it was not until about 1911 that this type of drive practically disappeared from motor-cars as a final drive. The main reason for abandoning it was the objectionable noise. Motor trucks and farm tractors use the chain drive to a considerable extent, and for trucks of over 3½ tons capacity it is undoubtedly the most efficient and effective of all types of final drive at present in use.

While formerly the chain business depended almost solely upon the automotive industries for its existence, this is no longer true, as the chain drive has found applications in hundreds of fields where belts and gears were formerly used.

With the increase in the variety of applications of chain drives there came a demand for a great variety of designs, until, about four years ago, one chain concern found itself with upwards of 130 models of various pitches, widths and roller sizes, exclusive of the many special chains for particular applications. A study of the situation showed that all practical requirements could be satisfied by reducing the total number of regular chain models to less than thirty, and standardizing with respect to the essential dimensions.

In 1917 the Council of the American Society of Mechanical Engineers appointed a committee on the Standardization of Steel Roller Chains, which held its first meeting on Sept. 14 of that year. Shortly afterward the Society of Automotive Engineers appointed a Roller Chain Division for the same purpose. These two committees held a joint meeting in December, 1917, since which time all of the work of the two committees has been co-operative.

Shortly after the first meeting in New York the British chainmakers formed themselves into an organization known as the Association of British Driving Chain Manufacturers, appointed a permanent secretary resident in

London, and immediately began the work of standardizing chains and sprockets. The British and American Committees corresponded for some time with a desire to arrive at common standards, and while not successful in reaching an agreement on all points, the approved standards of the two countries are the same in most cases, and where differences occur they are not sufficiently great to prevent American chains from operating over British sprockets.

Last year the Sprocket Committee of the American Gear Manufacturers' Association was invited to join the others in the work of standardizing a sprocket tooth form, and this committee met with the others at their last meeting in New York City.

The purpose of chain standardization is threefold:

- (1) Interchangeability of chains of different makes on the same sprockets.
- (2) Interchangeability of connecting links and spare parts.
- (3) Reduction in the number of models, and hence reduction of costs.

The purpose of standardizing the sprocket tooth form is:

- (1) To put the stamp of disapproval on tooth forms of the old type which provided for excessive pitch line clearance and encouraged hooked teeth, noise, and undue wear on the chain.
- (2) To reduce the number of different types of sprocket cutters now being made by putting the stamp of approval of the engineering societies on one type which conforms to principles of good practice.

In order that roller chains of different makes may be interchangeable on the same sprockets it is necessary that

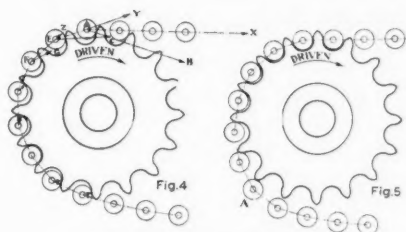


Fig. 4—Action of new chain on undersized sprocket. Fig. 5—Action when sprocket is cut too large, or when chain is too short

the pitch, the width, and the roller diameter should be standardized. And in order that connecting links shall be interchangeable on chains of different makes it is necessary that the pin diameters and the thickness of the inside plates should be standardized.

In order to bring about the standardization of these five dimensions the committees first adopted standard of reference, for each dimension in the shape of a formula, and endeavored to make the new standards conform to this as closely as existing practice would permit. These standards of reference were as follows:

Pitches: $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, 4 in.

Roller Diameter = $\frac{5}{8}$ P.

Widths, (defined as the exact distance between the inside plates) = 0.41 P and 0.61 P.

Pin Diameter = $\frac{1}{2}$ roller diameter.

Thickness of Inside Plates = $\frac{1}{8}$ P.

The standard proportions actually approved differed from the above in a few cases where present well established practice naturally had the preference over considerations more strictly classed as ideal.

In addition to the heavy series of roller transmission chains adopted by the S. A. E. a medium weight series has also been approved in which the same sizes of rollers, bushings and pins are used as in the heavy series, but assembled with lighter side-plates of the next higher pitch.

Thus a medium weight $1\frac{1}{4}$ in. P chain would be $\frac{5}{8}$ in. wide and have rollers $\frac{5}{8}$ in. in diameter.

A study of chain and sprocket action during recent years has led to the discovery of some important facts:

- (1) A light weight chain is more efficient than a heavy one.
- (2) A chain drive is more efficient under a heavy load than under a light one.
- (3) Increasing the number of teeth in the sprockets increases the efficiency.
- (4) A chain drive is more efficient when the small sprocket drives the large one than vice versa. This is true also of gears.
- (5) Other things being equal, increasing the pin diameter decreases the efficiency.
- (6) Removing the rollers from a chain makes almost no noticeable change in the efficiency.
- (7) High chain velocity is not as destructive to the drive as high sprocket speed.

Roller breakage is usually caused by high sprocket speed.

The maximum number of revolutions per minute that it is advisable to run the smaller sprocket is

$$\text{Max. R.p.m.} = \frac{2000}{P} \sqrt{\frac{L \times D}{W \times P}}$$

Where P = pitch; L = length of roller; D = diameter of roller; W = weight of one foot of chain. The constant 2000 was determined from tests.

- (8) The design of the sprocket tooth affects the amount of noise and wear on both sprocket and chain. The old style sprocket tooth form so long in use in this country is rapidly giving place to one or another of the newer types which have been developed during the last eight or ten years.

The essential difference between the old and the new types is in the provision made for an elongated chain. Every chain begins to elongate as soon as it is put into operation. This elongation, due to the wearing of the rivets and bushings, continues as long as chain is in use.

To provide for this continual lengthening of the pitch the tooth gap in the old style sprocket is cut with clearance on the pitch line, thus allowing the rollers on an elongated chain to creep around the pitch circle without interference with the backs of the teeth. The result of this is that the whole load is carried by one tooth at a time; and when the load is transferred from one tooth to the next the chain comes against the new tooth with a snap, making the action jerky.

In the newer type of sprocket tooth the pitch line clearance is eliminated, and at the same time the angle of the tooth gap is increased so that when the chain begins to elongate the rollers will tend to climb the teeth a slight amount. The result of this is that the load is distributed among a number of teeth, the action in transferring the load to new teeth is smooth and quiet, and the tendency of the teeth to wear hook-shaped is greatly reduced. (See Figs. 4 and 5.)

The principle of this new tooth form brings up the subject of *pressure angles*, and the questions as to what pressure angle is best, and whether the same pressure angle should be used for a small number of teeth as for a large number. British chain drive engineers have decided in favor of a constant angle of tooth gap (space angle) of 60 degrees and a consequent variable pressure angle which is determined by the formula

$$\text{Pressure Angle} = 30^\circ - \frac{180^\circ}{N}$$

This gives 28 deg. for a 90 toothed sprocket and 0 deg. for a 6 toothed sprocket.

In the United States this system has not met with much favor, as it does not allow sufficient pressure angle for a low number of teeth. One system which has been widely used in this country for the past seven years employed a uniform pressure angle of 30 deg. for all numbers of teeth with excellent results.

During the past year the standards committees of the A. S. M. E., the S. A. E., and the A. G. M. A. have taken up the work of designing a sprocket tooth and a set of sprocket cutters which have been recommended for adoption as an American standard. This tooth form, as it now stands, is designed to combine the desirable features of the Renold, the Diamond, and the Link-Belt types. The pressure angle is 11 deg. for 6 teeth, increasing to 15½ deg. for 9 teeth, and to 24 deg. for 100 teeth. The salient features of the new standard tooth outline (Fig. 6) are as follows:

(1) A seating curve, consisting of a circular arc whose diameter is $1.005 D + 0.003$ in. (D being the nominal diameter of the chain roller.)

(2) A working curve whose radius is 1.3 times the diameter of the chain roller and which is concave to the roller.

(3) A straight line portion.

(4) A topping curve which brings the tooth approximately to a point.

The object of making the working curve concave to the roller is to produce a softer contact between roller and tooth and to reduce the rapidity of wear.

Five cutters will be required to cut a range of sprockets from 7 teeth to infinity, graded as follows: 7-8; 9-11; 12-17; 18-34; 34 and over. Each cutter is based upon a number of teeth intermediate between the highest and lowest number to be cut, and the topping curve is such as to form a pointed tooth for the largest sprocket of the group, and a slight flat or "land" for others.

The outside diameter of sprockets are to be calculated from the formula

$$\begin{aligned} \text{Outside Diameter} &= \text{Pitch Diameter} + P \left(0.7 - \tan \frac{90^\circ}{N} \right) \\ &= (\text{Approx.}) \text{P.D.} + P \left(0.7 - \frac{1.592}{N} \right) \end{aligned}$$

The action of a chain running over sprocket teeth of

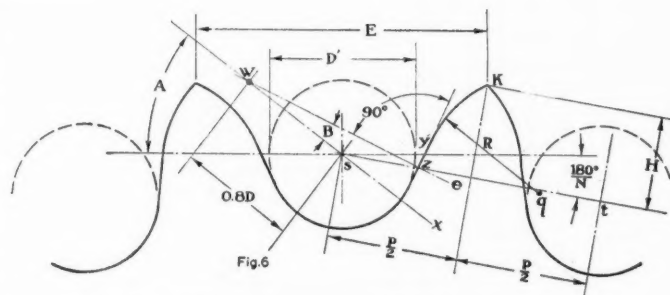


Fig. 6—Design of proposed American sprocket tooth

the new design is approximately as follows: When the chain is new and the pitch of the chain is exactly equal to that of the sprocket, all of the rollers will be seated. The load will be distributed among somewhat more than half of the teeth in mesh, with the greatest pressure on the first tooth, and the pressure on the succeeding teeth decreasing approximately in geometric progression until a point is reached where the slight pull on the slack strand of the chain produces a balance, and the pressure shifts to the opposite sides of the teeth. The pressure on the first tooth is

$$\frac{T \sin \frac{360^\circ}{N}}{\sin \left(31^\circ + \frac{27^\circ}{N} \right)}$$

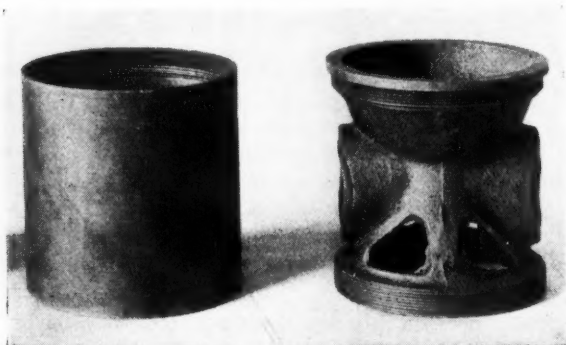
For an 18 toothed sprocket this formula gives a pressure of 63 per cent of the chain tension on the first tooth, 38 per cent on the second tooth, and 23 per cent on the third tooth, etc.

When the chain has elongated from wear there will be one and only one roller which will actually be seated at the bottom of the tooth space. This is called the "bedding down" roller. From that position the chain rollers take higher positions on the successive sprocket teeth in each direction, and in so doing not only distribute the load among a number of teeth, but also distribute the wear on the acting faces of the sprocket teeth and thus reduce the tendency to form hook-shaped teeth.

A Ringless Piston

A PISTON which is said to have worked satisfactorily without rings is now undergoing tests calculated to determine its value for general automobile use. The piston, shown in the accompanying cut, consists of two parts, a central casting which includes the head and piston pin bosses, and a shell of cylindrical shape which forms the bearing surface in contact with the cylinder wall. The two parts are connected by a thread. The shell, it is

claimed, has no tendency to go out of round under the influence of heat and, according to those interested in its development, shows no sign of leakage when made with 0.003 to 0.004 in. or more clearance. The oil film, it is said, maintains the necessary seal. The head of the piston is made either convex or concave to minimize change in diameter with change in temperature. The piston is made by the Ringless Piston Co., Inc.



Tismer ringless piston

ACCORDING to Arthur Williams of the New York Edison Company, there are 52,128 commercial vehicles registered in the New York Metropolitan District, and 30,356 are on Manhattan Island and in the Borough of the Bronx. During the year 1920, the number of commercial vehicles in these two boroughs was increased by 6,000. There are 9,157 electric commercial vehicles in the country, of which 5,000, or about fifty-two per cent, are in the Metropolitan District. During 1920, 536 were added, or something less than ten per cent of the total of motor vehicles added here that year. It is estimated that 30,000,000 kilowatt hours are now sold annually in this territory for vehicle charging from which revenues of between \$750,000 and \$1,000,000 are now derived.

Defining the Elastic Limit

The term "elastic limit" is used in more than one sense by various engineers. From a practical viewpoint it should mean the limit at which the proportional elasticity ends and the unproportional elasticity begins.

By William Ernest Dalby*

THE difficulty of defining the elastic limit is due to the fact that the term is used in more than one sense by engineers. Without traversing the various uses of the term, it will be generally agreed that the term elasticity, in its broad sense, means the power of a material to recover its primitive form after loading has been applied and removed. Recovery may be partial or complete. The power of complete recovery is lost when the stress produced by loading has once passed beyond a certain limiting value peculiar to the material.

Below this limiting stress the extension of a steel test-piece is proportional to the load producing the extension. Above this limiting stress the extension increases at a greater rate than the load. This limit, therefore, is called the limit of proportionality, and the term elastic limit is often used to define this point. This use of the term, the most general one, would seem to convey that the elastic power of the material is exhausted when once the stress has passed beyond the elastic limit, and the material has passed into a plastic state. This is by no means true. The material possesses elastic properties right up to the instant of fracture.

If a test-piece, loaded nearly to the point of fracture, is watched in the testing machine, and the load is quickly removed, the test-piece will spring back and to all appearances behaves as a perfect spring. Definite measurement shows, however, that the relation between stress and strain is unproportional. The test-piece shrinks toward its primitive dimensions unproportionally and fails to get to its primitive dimension by the amount of the permanent set. I have used the term unproportional elasticity to describe the state of the material in these circumstances.

To illustrate this point and some others, I throw on the screen a diagram, taken automatically in one of my recorders. The test-piece was new material and in the proportionally elastic state. Starting from zero the spot of light moved along a straight line to the point marking the limit of proportionality. The line then bent away and then the material yielded. The inner state of the material alters as the stress passes through the limit

of proportionality. One state merges into the other.

If the loading be stopped at any point after this limit has been passed, and then removed and afterward reapplied, the process involves the doing of work on the inner structure of the material, and the record of the process is a loop, the area of which represents the work done. The curved boundaries of the loop record the act that in reloading the strain increases at a greater rate than the stress. And in unloading the material shrinks at a greater rate than the reduction of the load. The first elastic hysteresis loop described by the process of unloading and reloading is the first step toward the breakdown of the material by fatigue.

From a practical point of view, therefore, the term elastic limit should mean the limit where proportional elasticity ends and unproportional elasticity begins. Unloading from any load below this limit and reloading can be done without describing a hysteresis loop. Unloading and loading, once the limit has been passed is always accompanied by an elastic hysteresis loop.

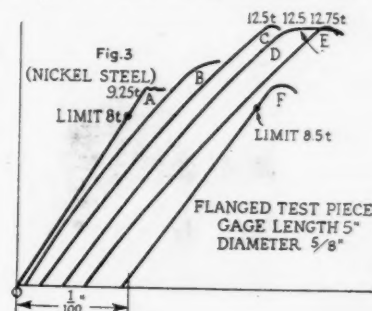
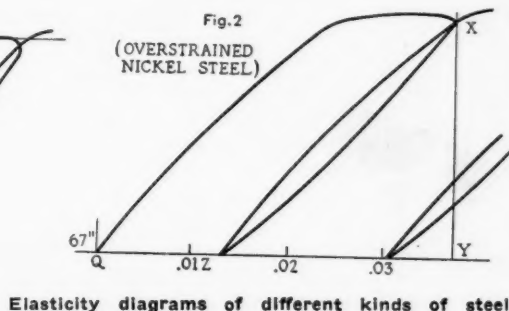
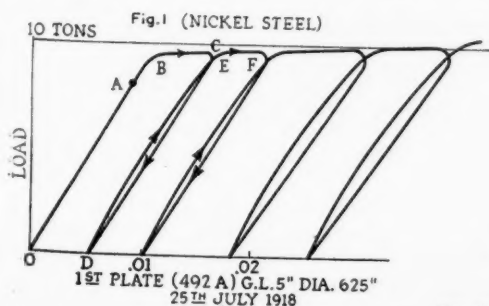
I illustrate this by a few lantern slides of diagrams I have taken from various materials.

Diagrams of this sort provide new data for the engineer from which to estimate the quality of the material. The new data are the area of the loops and the rate of increase of area. I have taken a succession of loops on several materials up to the point of fracture, and find that the area increases at first rapidly in some materials and then tends toward a limiting value. A typical instance of this is shown in Fig. 1, herewith.

Inner structure and elastic limit are mutually dependent. The microphotograph [not reproduced] of the inner structure of a piece of mild steel containing about 0.13 per cent carbon, shows the blocks to be of enormous size. The L. E. diagram corresponding to this shows the low yield-point, and therefore low elastic limit of 9.2 tons per square inch. The material was suitably heat treated to refine the structure, and then the yield point leaped up to 18 tons per square inch.

High elastic limit steel is produced by heat treatment designed to refine the inner structure. The temperatures refining the heat treatment are not obvious of the same for all steels, in fact each steel requires special investi-

*Condensed from a paper presented to the Institution of Civil Engineers by Prof. William Ernest Dalby.



Elasticity diagrams of different kinds of steel

gation of its thermal properties by means of cooling curves to find the regions of the necessary temperatures.

I should like to refer briefly to one point in conclusion. Proportional elasticity is destroyed by overstrain. A diagram illustrating this condition is reproduced in Fig. 2. The term overstrain means that the material has been loaded to the extent required to pass it into the condition of unproportional elasticity.

The behavior of irons and steels differs after overstrain. It is known that iron and soft steels tend to recover their property of proportional elasticity by mere lapse of time. And the state is reproduced in very short time by moderate heating as, for example, by mere boiling in water. But the hard steels and the alloy steels do not share this property. After overstrain they remain in that state without recovery indefinitely, and recovery can only be brought about by heating to high temperatures.

I cite one example. The material is nickel steel, the curves being shown in Fig. 3 herewith. The elastic line

of a fresh test-piece is shown at A. The piece was stretched 2 per cent and then a diagram taken, line B. The curvature shows a state of unproportional elasticity. Line C was taken after stretching to 6 per cent. Line D is a repetition test after a rest of 24 hours. In another test the lapse of time was one year. But in this example there was no restoration of proportional elasticity. Line E the diagram after boiling the piece in water—no effect. Line F taken after heating the piece to 550 deg. C. in a muffle for an hour. The elasticity recovery is perfect.

These few remarks will, I hope, show that the exact definition of the term "elastic limit," is a matter of some difficulty, because of the current use of the term in several cases. The term limit of proportionality may be used for the exact definition of one point in the load extension diagram, without interfering with the present uses of the term elastic limit. The limit of proportionality of a material is not a fixed point, but varies with heat treatment and vanishes with overstrain.

European Tire Construction

MICHELIN has just placed on the market a cord tire with steel studded band which appears to be the only one of its kind. During the past two years there has been a remarkable change in European tire construction, practically all makers having taken up the cord type, and as a consequence steel studded treads are used only on a very limited scale. In some quarters it has been claimed that the steel studded tread was destined to total extinction.

Michelin considers that the use of the steel studded tread should be encouraged, and has developed a metal non-skid with the cord construction. The tire is a development of the rubber tread cord tire known as the *cablé* which was brought out about two years ago. In the new type of tire the aim has been to combine all the advantages of the cord construction with the practically unpuncturable features of the steel studded tread. With a view to increasing the non-puncture qualities of the tire, the steel studs are made much broader and flatter than on old type steel studded tires. With a tire of this type there is a 90 per cent guarantee of the tire being used down to the cords without an accidental puncture by metal or loose stones. This is particularly advantageous on French roads which, while being fast, are often strewn with loose stones capable of going through an all-rubber tread. The cord tire with steel-studded tread sells at a price about 10 per cent higher than that of the same type with rubber tread.

The steel studded tire is excellent as a non-skid under

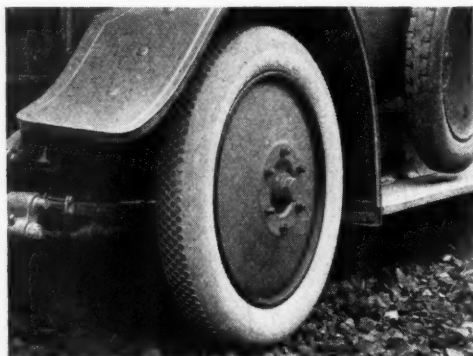
all conditions except dry granite sets, and it is for this reason that in the past the European practice was to use a steel-studded tread staggered on front and rear. Experiments have shown that when cars are fitted with four-wheel brakes there is no skidding on granite sets, and it is therefore possible on such cars to use steel studs on all four wheels, thus getting non-skid qualities under all conditions, together with a big guarantee against accidental puncture and the longer mileage of the cord compared with the fabric type. There are indications that in France at any rate there will be next season a sufficient number of cars with four-wheel brakes to make the use of steel-studded treads all-round quite a common practice.

The Pirelli Company of Milan, Italy, has just brought out a straight-side cord tire for racing purposes and made use of it for the first time on the Ballot cars in the French Grand Prix. No announcement has been made regarding the placing of this tire on the open market.

An Engineering Employment Service

THE wide and varied field of engineering activity has created the need of a clearing house of engineering services from which engineers of any specific qualifications may be obtained. In recognition of this want, the Federated American Engineering Societies, representing a combined membership of about 50,000, has established at 29 West Thirty-ninth Street, New York, an employment bureau for engineers of every variety of training and experience.

Applicants must be members of one of the Societies and submit a complete educational and professional record which is carefully classified, so that as the special requirements of any position are received, the records of men of suitable qualifications are submitted for consideration. The relatively large number of men with whom the Bureau is in touch, the comprehensive classification of records, and the fact that the services of the Bureau are free to employer and member alike, renders possible the selection of the right man for the services required. Negotiations may be confidential if desired. The Bureau will welcome inquiries from those seeking to build up or expand their engineering organizations.



New Michelin steel-studded cord tire

Minimizing Waste in the Handling of Lumber

A practical analysis of factors tending to cause deterioration of lumber and loss of time and money in handling, drying and storing this material. Causes of decay and the effects of improper drying, etc., are discussed.

By E. E. Collison*

THE necessity for cost reduction in all lines of manufacture makes it imperative that waste be eliminated, or at least reduced to a minimum. As wood is a large item in the cost of automobiles, it is well to look more carefully into our equipment for handling and caring for this material. Few manufacturers have really competent men to handle this end of the business.

Probably the greatest loss to the average woodworking manufacturer to-day is in the handling of the wood stock from the time it arrives at the factory until ready to be started through its course to the final finished product. The woodworking shop is often the last to adopt modern machinery and correct machine layout.

The cost of wood has risen until stock which would not have been considered at all a few years ago (such as poplar, gum, jack pine, etc.) is eagerly sought to-day, due to the prohibitive prices of the higher grades of stock and to the fact that the forests of the country are rapidly being depleted. There is good reason to install modern machinery and to make the stock pass through the proper machine at the proper time and in proper sequence. This eliminates the waste of time and labor which was formerly occasioned by moving stock back and forth during the process of manufacture. Instead of the slow processes and crude machines used heretofore, we find high-speed, heavy-duty machines doing the work.

The intention of this article is to show that there is need to concentrate efforts to eliminate waste in the yard and dry kilns.

Unnecessary Handling of Stock

Stock is frequently handled first from the car to the wagon; second, from wagon to pile; third, from pile to wagon; fourth, from wagon to dry kiln; fifth, from the dry kiln to the dry storage, and sixth, from this storage to the cut-up plant. This procedure is all preparatory to starting the stock through the modern plant. Is it any wonder that the cost of getting the stock ready is high?

It is doubtful whether the cost of these several handlings is greater than the loss due to improper care of the stock for the reason that the ordinary wood man does not understand the substance with which he works. The need to-day is for technically trained men in these positions. We see stock coming from the yard with stains (such as blue sap stain, mildews and other dry rots), and yet, by some it is believed that this sort of thing always has been and always will be; hence, a fixed charge is put against this loss.

Any form of decay is caused from bacterial life or a fungus that thrives under certain conditions, but can be checked to such an extent that it becomes dormant. Bac-

teria increase under certain favorable conditions, such as proper warmth and moisture, hence the fungus is noticed more at one season of the year than at another.

The increase of life of any form of bacteria is effected by the propagation of spores or individual units. The spores are spread from one place to another by some carrying agent such as wind and water. Each spore of a form of bacteria contains all the elements which, when put under proper conditions, carry on the life and spread the fungus.

The spore lodges on a certain board, for instance, and as the three proper conditions, moisture, warmth and a slight amount of aeration, are at hand, life begins. The spores send out tubes or arms which thrive on the wood substances, such as starch, sugars, etc., until the very life is eaten from the wood, and eventually the stock becomes fine dust or powder, held together by a mere shell, with little strength left. As the arms spread out and increase, they at times come to the surface of the board at various places, and at these places spores are again formed, which are transported to adjacent boards, or further away, by the carrying agents. This is especially noticeable in hard and soft maple and elm. The process is similar to that which results from placing a rotten apple in a barrel of good, sound fruit.

It is evident that the fungus or disease is propagated by the spore, and further that, if the spore can be killed off or prevented from spreading, the disease can be controlled. This can be and is being done. The slight expenditure required to stop this form of life will result in big returns.

It is far easier to prevent the growth or life of the fungus than it is to eradicate the spores after they have been formed.

Proper Yard Storage

If the stock is piled in the yard, the piles should be placed on piers made of a substance that will not itself become infected, such as concrete, stone, or brick. The tops of the piers should be 1½ or 2 ft. above the ground level, to allow ample circulation under the pile, in order to keep the lumber dry. Lumber should be piled on a high, dry spot or on well drained land, so that the ground does not cause the air to become moist or heated.

All infected pieces of lumber should be burned or segregated from the good stock, to prevent spread by contact. All loose chips and boards lying on the ground, or in favorable life conditions for the spore, should be raked up and burned. In other words, the yard should be kept clean.

Some mode of covering should be used—either a good shed or good cover boards, with the pile built on a slant, so that the rain will run off quickly and not drip on stock lower down in the pile. The pile should be built so that the ends of the boards are not exposed to the direct hot rays of the sun which cause a rapid drying of the exposed

* Works Engineer, General Motors Co., St. Louis.

ends, and result in end checking by the subsequent shrinkage of the stock at this point.

In all cases weeds should be cut down and all other conditions which prevent ample circulation under the pile should be corrected. The bottom of the pile should not be allowed to come into contact with the ground.

A good practice, found in many well-kept lumber yards, is to spread from 2 to 6 in. of cinders over the whole space, forming a well drained surface and preventing vegetation from taking hold.

Foundations should be of material other than timber, when possible, and should be durable, strong and solid. The top of each foundation should be level, and from front to rear the top surface of the parallel crossers should be in alignment, so that the lumber to be piled will bear equally upon each one. The foundation piers should be spaced not over 4 ft. apart, except for heavy stock, to prevent sag. The front piers of the foundation should be raised above the second, the second above the third, etc., to allow a slant in the stock of at least 1 or 1½ in. per ft.

Where the boards are of uneven lengths the overlapping ends sag. To avoid this condition, lumber of uniform lengths should be put on one pile, or else the longer lengths on the bottom and the shorter lengths above, to allow a bearing surface for the stickers, with no overlap. Boards in the several layers should be piled with a slight space between them for free air circulation. For the same reason, and also to facilitate fire fighting a space of at least 2 ft. should be allowed between stacks.

Stickers used in spacing the several layers of stock should be uniform in thickness, of course, and of proper thickness so that a standard sticker can be used throughout the yard, thereby eliminating hardships and mistakes on the part of the lumber handlers which would be caused by the use of several different sizes of stickers. They should be ¾ or 1 in. thick and a few inches longer than the width of the pile, preferably 6 ft. long. They should be placed one over the other in the pile, in order that a solid bearing surface is given, to prevent warping.

Handling Lumber in Bulk

In the more modern yards, all the lumber is piled directly from the cars to the kiln trucks, and, as the whole yard is laid out on rails, whereby a flexible arrangement is secured, the piles on the cars are easily handled in bulk to the yard, back to the kilns, or directly to the kilns, and finally directly to the machines. All these operations are accomplished, not by the old method of piling and repiling each time, but simply by the transferring of the cars; consequently, the lumber is handled but twice: First, when it is piled on to the trucks from the car, and second, from the trucks to the machine on its way to a finished article.

In the larger yards, where thousands of feet are handled daily, power transfer cars are used rather than the ordinary push transfer car. This in itself cuts down the labor cost and increases the ease of handling, as well as shortening the time.

All grading should be done at the place of shipment when possible. This is a big paying factor in large operations, as it eliminates this slow operation at the plant in unloading cars, thereby reducing time and curbing the demurrage costs on freight cars. It also eliminates cull stock from shipment, which allows a greater useful shipping capacity and lowers freight charges.

The dry kilns should be the very best; that is, the selection of drying equipment should not be based upon initial costs, as the operating and time expense on drying will soon eat up the amount saved on the initial expenditure. Equipment that is the most flexible—one that can dry all grades, sizes and thicknesses—rather than one that is limited as to what it can do—should be procured.

The fundamental conditions for drying, requisite heat, proper humidity, and circulation must be obtained.

Any reliable automatic equipment for control of heat or humidity is a big asset to any dry kiln, in that the extra cost will soon be taken up by the improved quality of stock obtained, the decrease in time required for drying, and the avoidance of all worry on the part of the operator. There are many such contrivances on the market to-day, but the majority are too complicated and in many cases are purchased from outside agencies which are not dependable.

Controls should be conveniently located and equipment supplied for making the humidity readings without the operator entering the kilns. There is equipment of this kind to be had that is mounted in the face of the kiln wall. A person who has ever entered a kiln at a temperature of 160 deg. Fahr. will readily appreciate that the operator is not going to make any more humidity tests in the kiln than necessary. You simply pay the bill in unknown losses. Instruments, such as recording thermometers, hygrometers and testing machines, constitute a great asset in the furtherance of proper handling of lumber through the kiln.

Dry Storage

Wood readily absorbs as well as gives up moisture, depending upon surrounding air conditions. If wood is dried down to 5 per cent moisture content and put into a shed in which the relative humidity of the air is not controlled, it will soon pick up additional moisture, the amount being dependent upon the exact climatic conditions. So much additional moisture may be accumulated in the stock that trouble will occur during the manufacturing process, or later, in the finished article.

A dry storage should be used in connection with the dry kilns, so that any surplus stock, or stock that has been kiln dried, may be held at the proper moisture per cent by controlling the relative humidity of the air in the building or room. Just a few heating coils, and ventilators in the roof of this building, are ample for this control.

The lumber on each car should be tested for moisture content when put into the dry storage, and a notation should be made on both the car record and on a tag that is tacked on the stock. Before the stock is used, another test should be made for moisture content, previous to the stock's being removed from storage. If the moisture content has accidentally risen, it is much easier and quicker to dry this off than it is to cull out many pieces during the process of manufacturing, due to checking and the like.

Body stock that is stored in a shed can be kept at 8 per cent moisture content indefinitely, if the temperature is held at 70 deg. Fahr. and the relative humidity at about 42 per cent.

Low humidities in factory buildings are often lost by the fact that windows and doors are opened, which soon allows the air condition to become the same as that of the outside atmosphere. Then again, humidities in various parts of units of the factory should be about uniform, as it is evident that the differential in humidity to which stock is subjected in passing from one unit of low humidity to another of higher humidity, or vice versa, will cause the stock to work. Inserting pet cocks on the steam heating coils, or putting in steam jets throughout the factory, will give a simple means of raising or lowering humidity.

Keep records of your operations, both for the purpose of bettering these records and for reference on future work. Standardize your operations. Standards are here, as everywhere, fundamental to progress and efficiency. You must have standards for supply and use of time, materials and equipment before you can determine what conditions are best. You must make use of records in order to determine the relative efficiencies of different trial conditions under investigation.

Grinding in the Automotive Industry

Part III—Grinding Engine Parts

In this instalment the application of grinding to specific parts of the vehicle is discussed. Tolerances before and after grinding are given together with particulars as to type of machine and grade of wheel.

By P. M. Heldt

PERHAPS the best way of dealing with the application of grinding in the automotive industry is to take up in succession the more important parts of the vehicle in the manufacture of which grinding is used and briefly describe the processes employed.

In the engine there is hardly a part that does not have grinding work done upon it. The most important grinding operation in engine manufacture is the grinding of the cylinder bore. The power and efficiency of the engine depend to a large extent upon the accuracy and smoothness of the bore. The latter must be as nearly as possible a true cylinder; it must be perpendicular to the base and it must be smooth. It is impossible to obtain as smooth and accurate a surface by machining as by grinding. Cast iron is not of absolutely uniform hardness, and whatever hard spots there may be in the cylinder wall will spring away from the boring tool, causing a high spot, especially if the wall is comparatively thin, as it usually is in automobile engines.

The first machine to be used for cylinder grinding so far as recorded was a Brown & Sharpe grinder, but in 1905 the Heald Machine Co. began to specialize in the manufacture of cylinder grinders, and this concern has supplied most of the grinders of this type in service in the automotive industry to-day. It is interesting in this connection to note that the first order for a cylinder grinder was placed with the Heald company by Elwood Haynes, the well known pioneer of the automobile industry. The extent to which grinding is being used to-day for finishing the bores of internal combustion engines may be judged from the statement of one manufacturer of internal grinders that 84 per cent of all makers of passenger cars use engines with ground cylinders, and 91 per cent of all makers of motor trucks. Grinding is also used for refinishing the bores of cylinders after they have become scored or worn out of round.

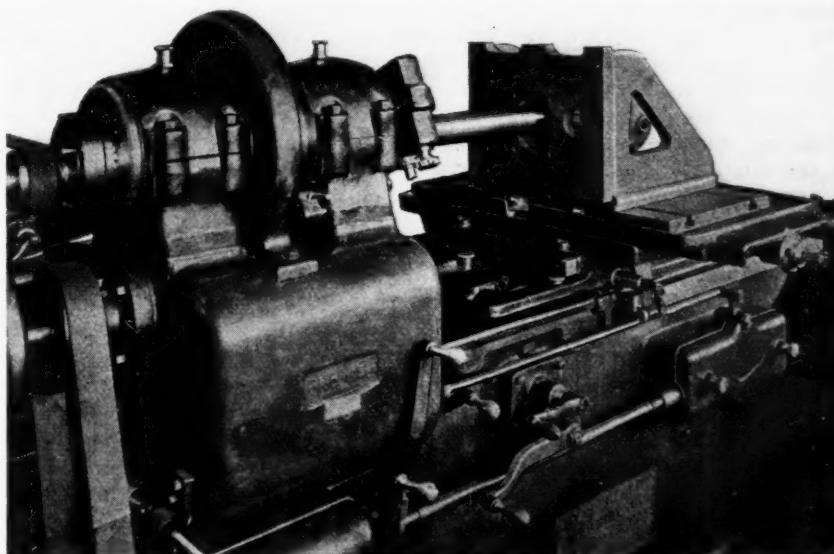
Cylinder Grinding Data

In one well-known engine plant from 0.008 to 0.012 in. stock is allowed in the cylinders for grinding, and tolerances of plus and minus 0.001 in. are called for on the finished bore. Twelve cylinder blocks having four $4\frac{1}{2}$ x 6 in. cylinders each are finished per 8-hour day in one of the cylinder grinding machines.

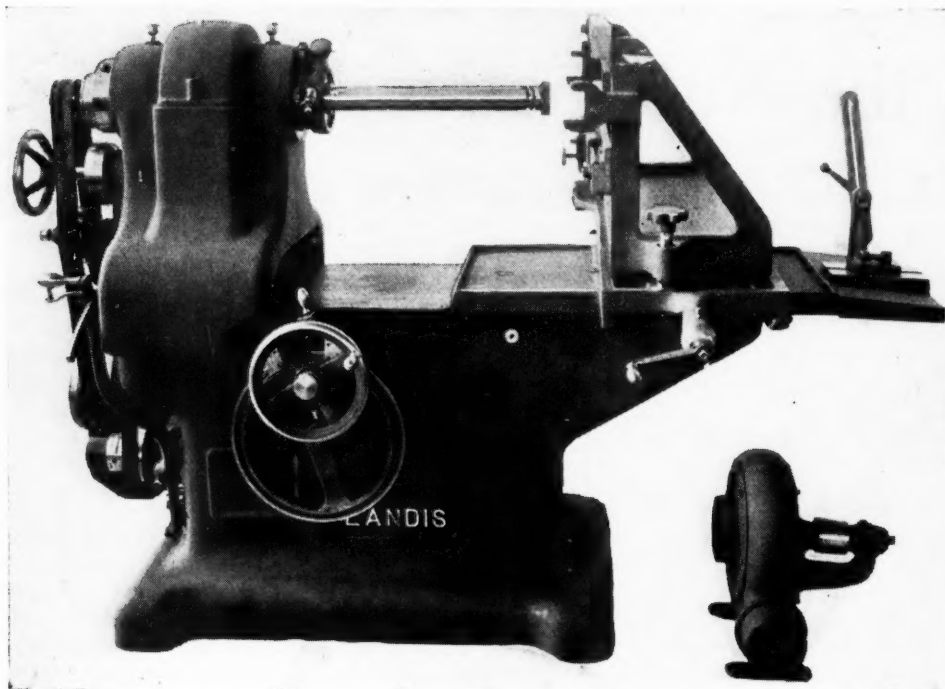
In another plant individually cast cylinders of a large tractor engine are ground. The limits on the turned bore are 6.483

and 6.488 in. and the bore has a length of 11 $\frac{13}{16}$ in. In the rough grinding operation 0.017 in. of stock is taken out, that is to say, the bore is enlarged by this amount, while the finish grinding operation enlarges the bore another 0.001 in., making the final limits 6.5025 and 6.5045 in. As in practically all cylinder grinding, silicon carbide wheels are used, of 36 grain and soft grade.

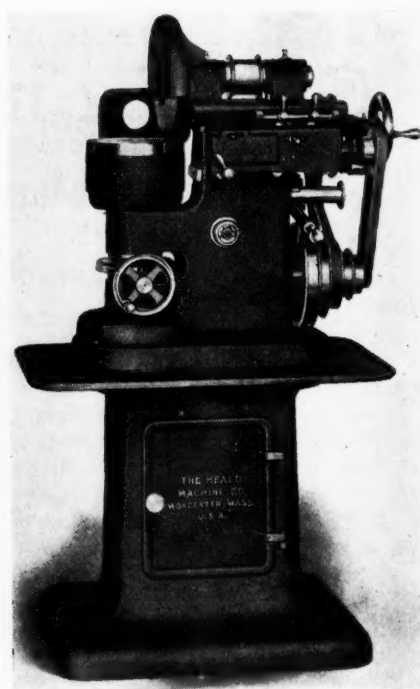
Cylinder grinding is done dry, because water played on the work would form with the metal dust ground off a mud which would choke the wheel. A certain amount of heat is generated in the course of the operation, depending on the hardness of the metal, the hardness of the wheel and the rate at which the work is pushed. To keep the working surfaces at a uniform temperature, cold water is usually run through the jackets of the cylinder block. The dust formed by the grinding operation is carried away dry by means of an exhaust fan. It has been suggested in the past to run hot water through the jacket so as to maintain the cylinder block at substantially working temperature while grinding it, and this plan has been followed to some extent. To-day most manufacturers are using cold water in the jackets, however. The reason is that cylinder bores must be inspected for accuracy after completion, and this inspection usually takes place an hour or more after the grinding operation has been completed, when the block has returned to normal temperature. The cylinders will distort somewhat during the process of cooling, and if they were exactly true after the grinding oper-



Cylinder grinding on a Heald grinder



Landis cylinder grinder



Heald piston ring grinder

ation they are sometimes slightly out after they had cooled, with the result that blocks which were ground with the highest accuracy by this method may be rejected by the inspectors.

Grinding Valve Sleeves

Cylinder grinders are also used for grinding the internal surfaces of the valve sleeves of Knight engines. In the case of the Stearns-Knight the sleeves are held in a cylindrical fixture which is cast with a double wall to form a water jacket, and water is circulated through this jacket to keep the sleeve at a uniform temperature. These particular sleeves are finished to an outside diameter of 4.6923 in. and an inside diameter of 4.250 in., and they are 13.125 in. long. The tolerance on the bore is 0.0005 in. and the production is about 50 per 10-hour day.

As an instance of the illogical practices of some firms in the use of grinding equipment, one manufacturer of internal grinding machines relates the following: One of the best automobile factories in the country obtains cylinder castings from two different foundries; unfortunately the castings from the two sources are not kept separate in going through the factory, and therefore every cylinder grinding machine has to handle castings from both sources in the same lot. It so happens that the iron of one foundry is very soft and easy to cut, its scleroscope hardness ranging between 18 and 20, whereas the iron from the other foundry is very hard, showing a scleroscope hardness of 38 to 40, and it is very difficult to find a wheel which will produce a smooth surface on it. Yet these people expect satisfactory work with these very unlike castings on the same grinding machine and with the same wheel. If they would only cast small distinguishing marks on the castings made in the two foundries it would be an easy matter to keep them apart, and by working on one lot on one day and the other on the next they could use a different grade of wheel for each and thus achieve much better results.

Characteristics of Cylinder Grinder

Cylinder grinding machines differ materially from plain internal grinders for the reason that most parts that re-

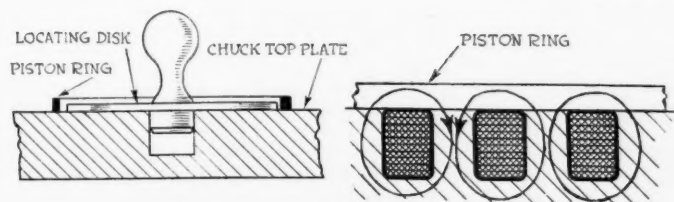
quire internal grinding are of plain cylindrical or other simple shape and can readily be held in a chuck and revolved, so that the axis of the wheel may remain stationary, but a cylinder block is so heavy and of such irregular shape that it cannot well be swung in the machine. The operation therefore called for a machine in which the wheel spindle, in addition to its axial rotation, has an eccentric motion to bring the wheel in contact with the entire circumference of the bore. The cylinder block is bolted and doweled to a fixture secured to the carriage of the grinder and one bore is ground at a time.

Piston Ring Grinder

Another special kind of grinder used in the automotive industry is the piston ring grinder, and this was introduced even previous to the cylinder grinder. Piston rings must be accurately finished on both sides and on the circumferences. The latter surface can easily be finished in an ordinary cylindrical grinder after the ring has been clamped on a mandrel. When the rings are turned off in the lathe a rough edge is almost sure to be formed, which prevents a gas-tight joint with the side of the ring groove. Moreover, when cutting off the rings from a pot with multiple tools, the different rings do not come of exactly equal thickness. It appears that all piston rings manufactured to-day are finished to thickness by means of grinding.

A machine for finishing the sides of piston rings by grinding was brought out in 1903 by the Heald Machine Co. A magnetic chuck was used for holding the rings, on a vertical axis, the rings being simply placed on the chuck. The grinding wheel, which was carried in a sliding head moving horizontally, would travel from the outside to the center of the chuck and back again. The same machine could be used for grinding disks, thrust collars and similar parts.

The plan of holding the rings in a magnetic chuck proved entirely practical, ensuring rapid operation and high accuracy. Almost any mechanical way of holding the rings would have caused distortion. It is claimed that rings can be manufactured in quantity in this way with a



Diagrams illustrating principle of magnetic chuck

limit of accuracy of 0.0005 in. as regards the measurements of different rings and in a single ring the tolerance around the circumference is held to 0.00025 in.

Piston ring grinding is a special form of surface grinding. In order to save time the work is not fed in a straight line toward the wheel, but is rotated around its axis. There are two general types of piston ring grinder; in one the grinding wheel grinds with its cylindrical surface and its horizontal spindle is mounted on an automatically reversing wheel slide; in the other the wheel is of the ring type and operates with one of its end faces. According to the diameter of the work, the wheel is set by a lateral movement of the wheel slide.

Grinding Pistons and Piston Pins

Pistons are ground on their outside surface which bears on the cylinder wall, in order that that surface may be true and smooth. This work is done in cylindrical grinding machines. In one particular plant the pistons, which are 4½ in. in diameter, come to the grinding department rough-turned 0.030 in. oversize and are finished in a single operation with tolerances of plus and minus 0.0005 in. Aluminous wheels of 24 grain and medium grade are used. The output is 300 per eight-hour day. For holding the pistons in the grinder one end is centered, while a cap, placed over the open end, is held in position by a dummy piston pin which passes through the piston bosses and the shank of the cap. In another plant producing a high grade car the pistons have a number of grinding operations performed upon them. In the final cylindrical grinding operation from 0.004 to 0.007 in. is taken off the diameter, the skirt being brought down to a diameter of 3.375 in. with tolerances of plus zero and minus 0.001 in. In this case silicon carbide wheels are used, of 36 grain and soft grade. The time is two minutes per piston.

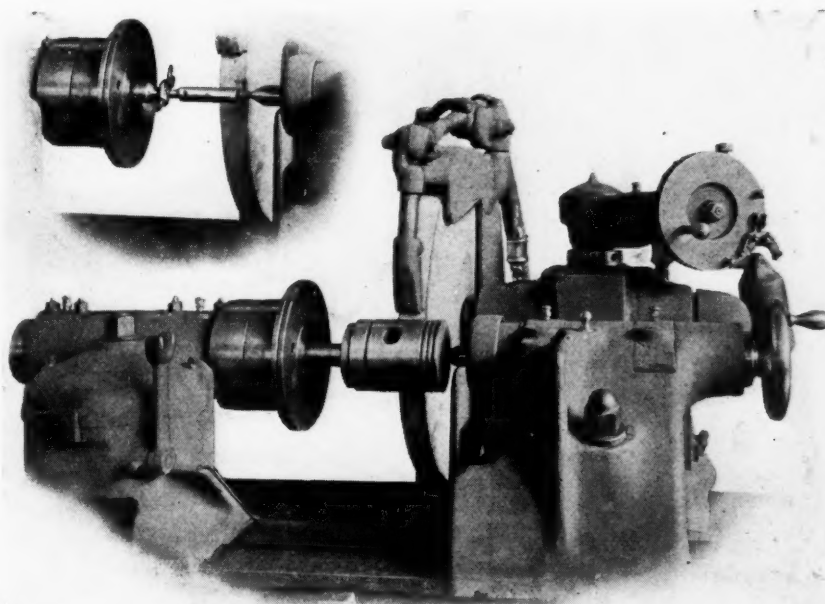
Piston pins are ordinarily of case hardened material and the common method of finishing them is by grinding. They can be ground either on a mandrel between centers or in a wedge type of steady shoe, the first method being preferable as far as results are concerned.

At first sight it might be thought that there would not be much chance for grinding operations on the connecting rods, but such is not the case. Grinding starts with snagging of the rough forgings and ends with the finishing of the outside surface of the piston pin bearing bushings which are of phosphor bronze. The end faces of the two ends of the rod can be faced off to advantage in a face grinding machine with magnetic chuck. A considerable number of rods can be placed in the machine at once and the chuck fed under the ring type of grinding wheel at a speed of about 25 ft. per min. All the advantages of surface grinding with magnetic chuck are here attained, including accuracy and rapid production. The plane surfaces of the joint between the cap and

the rod may also be ground if a high grade product is aimed at, and after the cap has been bolted in place the big end is bored out by means of a special fixture. These operations on the connecting rods are generally performed with vitrified aluminous wheels of 36 to 46 grain and soft grade. Grinding of the piston pin bushing is practiced by the Buda Co. The bushings are first bored, reamed and faced at one end in a screw machine and are then placed on an arbor and put in a grinder in which from 1/8 to 3/16 in. is removed from the diameter, the bushings being finished to tolerances of plus and minus 0.0005 in. Formerly the bushings were first turned in the screw machine to within 0.015 to 0.020 in. of the finished size, but now they are ground to the correct size directly from the rough. The production in the grinder is 600 per eight-hour day and it may be readily imagined that a good deal of work is saved by eliminating the turning operation on outside diameter.

STATE control of gasoline in France came to an end in August when the last of the army reserve stocks of gasoline were sold. From now on the importation of gasoline is free, with the exception that a certain percentage of the fuel imported must be kept in reserve for military use when required. The retail selling price of gasoline has been maintained at an artificial level by the law obliging importers to purchase government stocks of fuel to the extent of 50 per cent of their imports, these stocks being paid for at excessively high prices.

Outside Paris the minimum retail selling price of high-grade gas is now 9 frs. 40 per can of 5 litres, being equivalent, at current exchange, to 56 cents per American gallon. A further reduction is expected before the end of the year, but the determining factors now are exchange rates and freights. The American system of bulk storage and curb side pump distributing stations is making great headway in France, and particularly in the neighborhood of Paris. Dealers who stock gasoline in cans are obliged to cut their profit to almost vanishing point in order to compete with the pumps. The French motoring public appears to appreciate the time saved and the economy gained by use of pump-filling stations compared with the can system.



Grinding cylindrical surface of piston and piston pin (Landis)

A New Principle Used in Machine for Producing Spur Gears

Multiple cutters are employed to form several teeth simultaneously. Operation is similar to that of a vertical shaper except that the tools are held stationary and the gear blank is reciprocated.

A DISTINCT innovation in gear production methods is employed in a newly developed machine for the production of spur gears in quantity. In the usual type of gear planing machine one tooth is cut in the blank at a time, a single cutter being used. This principle is departed from in a new type of gear cutter which has been developed by the Stevenson Gear Co., in which all of the teeth or a simple fraction thereof are cut at the same time. Evidently, if the number of teeth in the gear to be cut is a prime number, the same number of cutters as teeth must be used; if it is an even number, half the number of cutters can be used, and if it is divisible by three, one-third the number of cutters as teeth will do. The essential member of the machine is a special tool head which consists primarily of a series of radially disposed tools spaced about the circumference of the blank to be cut.

This machine operates in the same manner as an ordinary vertical shaper, except that the tools are held stationary and the gear blank is reciprocated past the tools. The mechanism of the machine consists essentially of a ram carrying a blank supporting arbor and the multiple tool head for operating upon the blank. The frame of the machine is a casting of rectangular box section with a vertical cylindrical portion at one

end. The ram is mounted in the center of the cylindrical part of the frame and the tool head is mounted above the ram at the top of this portion. The crank shaft which drives the ram is journaled near the top of the rectangular section; it is provided with an adjustable crank head at the end next to the ram and is driven through back gears by an electric motor. The arbor which carries the gear blanks is not made solid with the ram but fits in a socket in a spindle which is journaled inside the ram and is free to rotate independently of the reciprocating motion imparted to it by the ram. An intermittent indexing movement is imparted to the spindle after each cutting stroke by an intermittent gear train. The machine is 7 ft. high, weighs 17,000 lbs. and when operating to full capacity is driven by a 100 hp. motor. Its capacity is for gears 12 in. in diameter, 6-in. face and 4 diametral pitch.

The tool head consists essentially of a flat steel disc 3 ft. in diameter, provided with a hole at the center and a number of radial grooves cut in its face in which the tool bits are arranged like the spokes of a wheel about the circumference of the gear. Successive feeding movements are imparted to the tools by an annular sectional cam ring. As the gear blank is reciprocated past the cutting tools, the tools are gradually fed in by successive cuts to the full depth of the tooth. At the completion of each stroke of the ram and before the next cut begins, the gear blank is indexed a space equal to one tooth, thereby presenting a different tool to each tooth from the one which made the previous cut. After the tools have been fed in to full depth, they are held stationary in that position while the cutting process continues until the gear has indexed one complete revolution, thereby giving each tool an opportunity to take one last cut on each tooth. This final complete index insures a uniformity of spacing of the teeth in the gear equal to that of the indexing mechanism. Uniformity of the tooth form is secured even though the tools themselves may be far from uniform for it is at once apparent that if any tool is longer or wider than any other tool, even though it be only a thousandth of an inch, that portion of it which is longer or wider will take one last cut on the corresponding portion of each tooth in the gear, thereby eliminating any variation which may have been caused by previous cuts. It is claimed that by this process of finishing all the teeth of a gear with a single

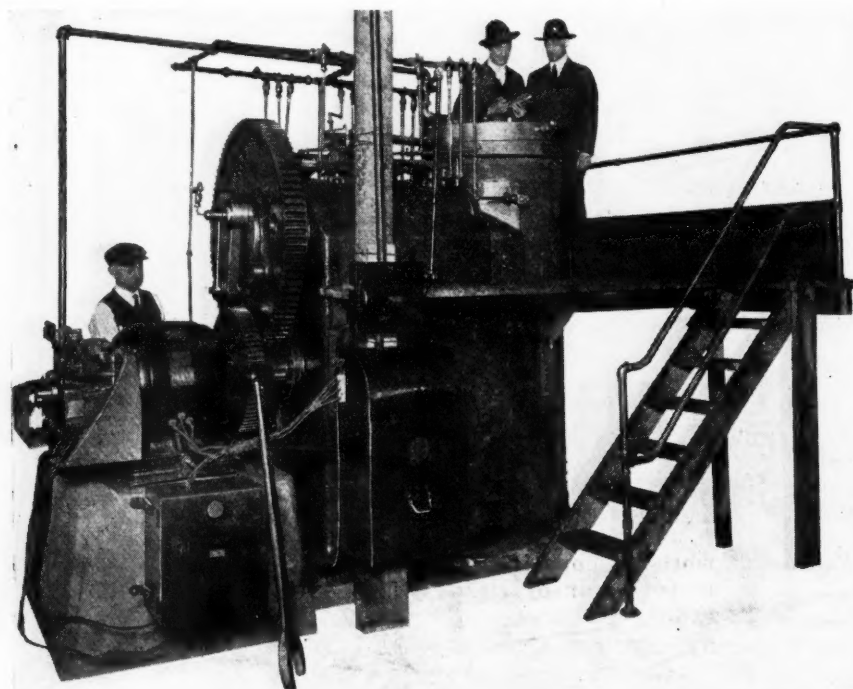


Fig. 1—Stevenson multiple cutter gear shaper

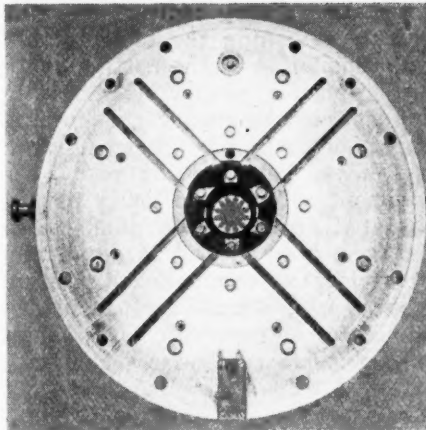


Fig. 2—Tool head for Stevenson gear shaper

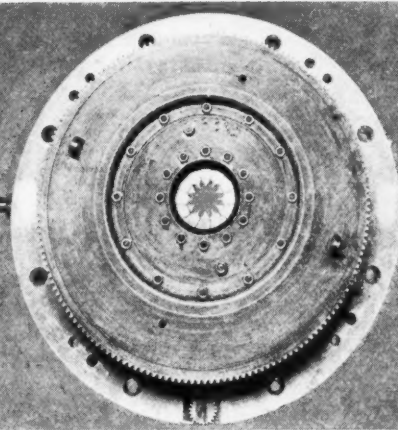


Fig. 3—Bottom view of tool head

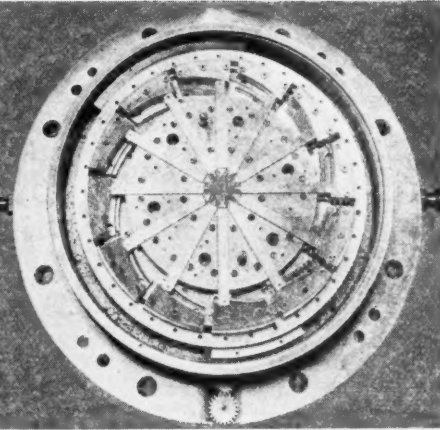


Fig. 4—Tool head, showing tools and feed cams

finishing tool, this machine attains great accuracy, and the speed is multiplied by the number of tools operating on the gear blank at one time.

Fig. 2 at the top of this page shows a top view of the tool head as it appears when in operation on the machine. Fig. 3 is a bottom view as it appears when taken off of the machine ready for disassembly or adjustment. In Fig. 4, the tool head is partly disassembled to show the principal details of the mechanism. When it is mounted on the machine, as in Fig. 2, the only working parts to be seen are the points of the tool bits surrounding the gear blanks and the small depth adjustment dial seen in the upper part of the illustration. The four pairs of T slots seen in this illustration are for attaching a piloting device which is used on extremely long and slender arbors which may need an outer support. Two tool heads are provided for each machine and while one is in use on the machine, the tools of the other are being sharpened and re-set ready for use after the tools in operation begin to dull. The tool head is held in place by 8 studs and nuts. When it is desired to set up a new job or to sharpen the tools, these nuts are taken off and the head is lifted off the machine and replaced by the other head. This arrangement permits the machine to operate practically continually with little loss of time on account of set-up and sharpening tools. As the tool head is taken off the machine, it is turned bottom side up on trunnions as shown in Fig. 3. The clamp gear and plate are then removed, exposing the tools and feeding mechanism as in Fig. 4.

The tool bits shown in Figs. 4 and 5 are rectangular in section, except the lower side, which is in the form of a "V." The gear tooth profile is formed at the inner end of this tool and is backed off to permit sharpening without changing the form. The outer end of this tool rests against a spiral cam surface and is ground in the form of an exact radius. A small pin near the back end fits in a groove which has an opposing spiral surface and retains the tool in close contact with the other cam surface to insure correct contact, as well as to withdraw the tools to their starting position after the cut is finished.

The individual cam lugs are mounted on a large ring which encircles the tool bits and spacing plate and are held down by T bolts which fit in a circular T slot in the ring. The tool bits are adjusted for depth independently by moving these cam lugs individually along the T slot relative to the cam ring and each other. Simultaneous feeding movements are imparted to the cam ring through the 2 idler gears seen in the lower part of Fig. 4 and are produced by a feed mechanism

which will be explained.

The final depth to which the tools are fed is determined by an adjustable stop which limits the rotary feeding movement of the cam ring. This feed mechanism being spring actuated, the position of the depth controlling stop can be varied within reasonable limits without resetting of the feed mechanism. This is particularly desirable during the operation of the machine in cases where the tool bits may not have been set to exactly the right depth in the beginning or in cases where the keen edge wears off the tools and they begin to cut gears that are uneven or oversize long before they are actually dull. The dial which controls this adjustment is seen in the upper part of Fig. 2 and can be reset quickly when desired.

In order to provide relief for the tools on the back stroke of the ram, a reverse feeding movement is imparted to the cam ring and before the beginning of the cutting stroke; the forward feeding movement of the cam is made great enough to compensate for the slight retraction for relief and also to provide the necessary additional feed for the depth of the next cut.

The large gear and plate shown in Fig. 3 are used to intermittently clamp and release the tool bits during the cutting and feeding operation. The lower central plate is mounted directly above the tool bits and is provided with adjustable set screws and lock nuts above each tool. The outer gear member is free to rotate about the central plate and is provided with screw threads which engage a corresponding threaded portion of the tool head base. A rotary reciprocating motion imparted to this gear by a cam operated segment clamps the tools during the cutting operation and releases them

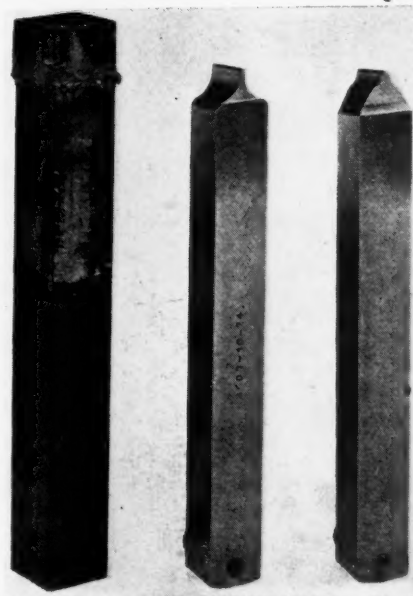


Fig. 5—Tool bits used with Stevenson gear shaper

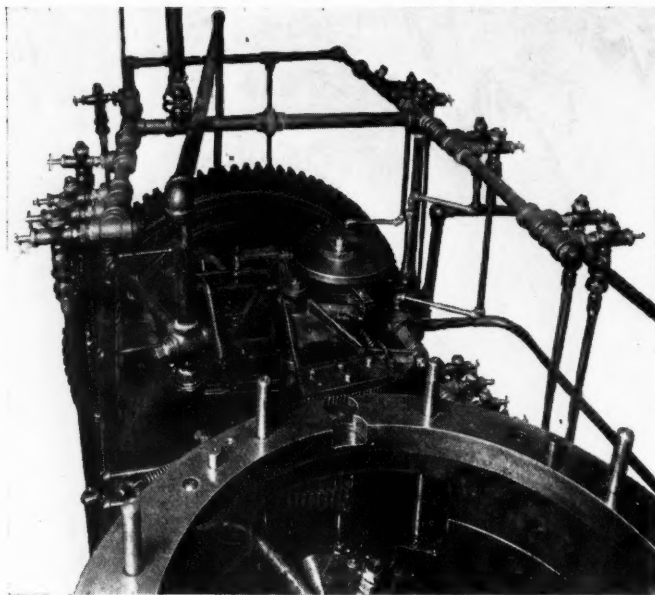


Fig. 6—Feed and clamping mechanism

during their relief and feeding movements. This clamping arrangement by forcing the "V"-shaped seat on the tool bit into a corresponding "V"-shaped seat on the spacing plate in the tool head serves to centralize and accurately locate the cutting point of the tool and in addition to take up clearance and looseness, so as to eliminate vibration and chatter.

The feed and clamping mechanism shown in Fig. 6 comprises the segments and cams for actuating the tool head feed cam and the tool clamping gear. The feed cam segment, which is shown near the center of this illustration, swings about the central stud as a fulcrum and is moved directly by a spiral cam. This cam is rotated intermittently by a ratchet on which it is mounted and can be adjusted to produce various feeding motions. It can be seen from the illustration that this cam has a

long gradual slope for the feeding movement and a sharp descent for quickly returning the tools to their starting position at the completion of the cutting operation. The slight retraction for producing the relief movement is accomplished by mounting the fulcrum stud eccentrically on a shaft, which is given a partial rotation by a face cam on the large driving gear. The tool clamping gear segment seen in the lower part of the illustration is actuated directly by a push rod in contact with another face cam on the large driving gear. The releasing movement is accomplished positively, but the clamping movement is effected by means of a spring, in order to eliminate the possibility of breaking some part if the clamping mechanism were accidentally adjusted too tight.

The indexing mechanism, as shown in Figs. 7 and 8, consists of a split bushing guide, one-half of which is attached to the ram spindle, the other half being attached to a revolving drum on which is mounted a worm gear driven by a worm and an intermittent gear train. The intermittent indexing movement is derived from a Geneva wheel and is transmitted through a set of change gears to the worm and worm wheel. By varying the ratio of the change gears in the train, indexing movements for any desired number of teeth may be obtained. Minute angular adjustments of the spindle position varying by one second of arc, for locating keyways, teeth of cluster gears, etc., are obtained by means of a differential clutch between the worm and worm shaft.

The main crank shaft is connected to the large back gear by a quick return crank of the drag link type, as seen in Fig. 1, which imparts a slow motion to the ram during the cutting stroke and a quickly accelerated motion for the return. The driving motor is mounted on a sliding base and drives through a single set of speed change back gears. The drive for the indexing mechanism is taken direct from these gears. The pump for circulating the cutting oil is driven from a small sprocket on the end of the motor shaft opposite the driving pinion. The motor is controlled by a push button switch, automatic compensation and solenoid electric brake.

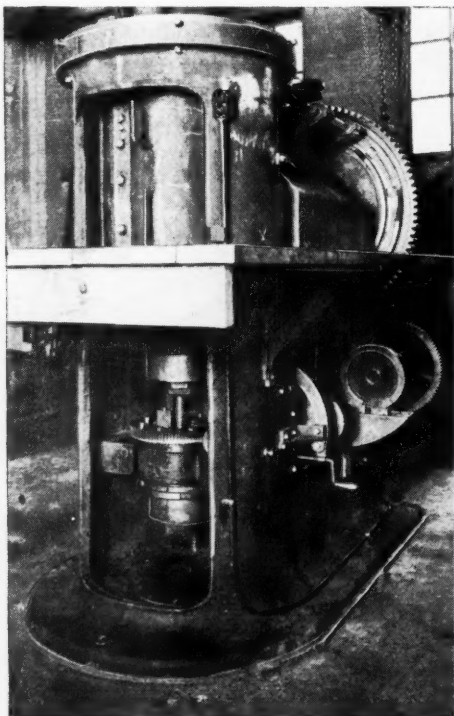


Fig. 7—View showing indexing mechanism

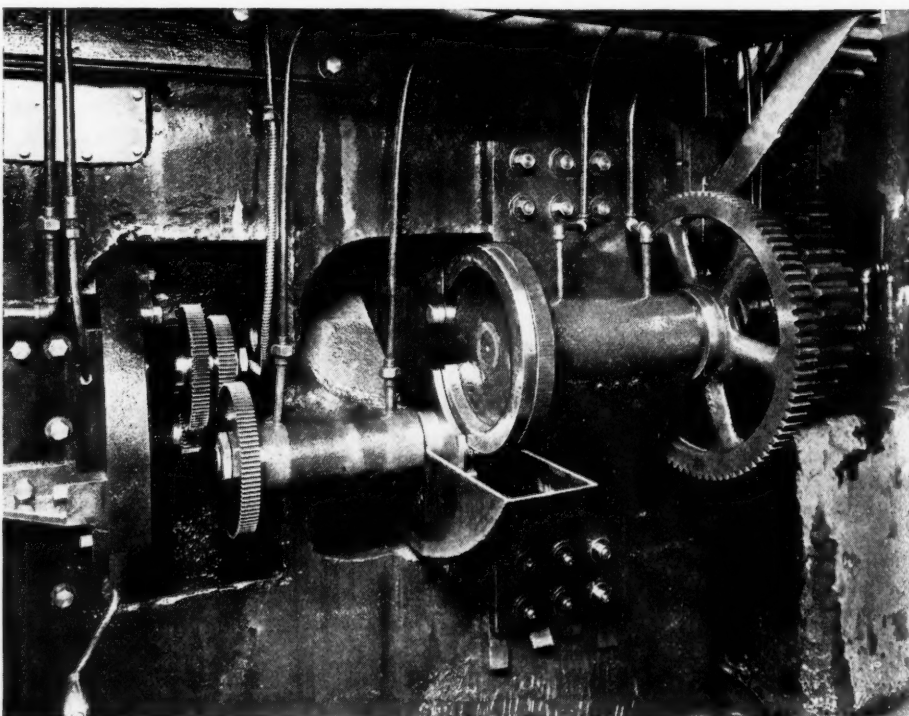


Fig. 8—Another view of indexing mechanism

Educating the Truck Dealer to Sell Transportation

The dealer must be taught to sell transportation. He must learn how to make a detailed analysis of specific haulage problems; how to determine the truck units best fitted to perform efficiently in each case. Here is how one manufacturer is presenting transportation analysis to his dealers.

By Norman G. Shidle

THE future development of the motor truck industry depends largely upon the recognition by manufacturers of the broader aspects of merchandising problems. The truck is a unit of transportation and must be marketed as such. The truck manufacturer is selling transportation rather than motor vehicles. To properly sell transportation considerable data as regards operating conditions, operating costs, etc., must be developed. Principles underlying proper analysis in any given instance must be determined and tested. The task embodied in developing these features of transportation merchandising has scarcely been begun and the individual effort of all manufacturers will be necessary before sufficient data can be obtained to form the basis of any comprehensive study.

It is possible immediately, however, to discuss the factors entering into the analysis necessary in selling truck transportation equipment to the user. A few firms have recognized the importance of the problem confronting them, have developed certain principles and, in specific instances, have accumulated considerable performance data.

The manufacturer is likely to find that he will have to be the leading spirit in developing this idea of selling transportation, of outlining detailed methods of accomplishing it, and of instructing his dealers both in fundamentals and in details. For this reason the work of the Selden Truck Co. is of special interest at this time. This company has outlined for its dealers the various factors entering into a transportation analysis, has instructed its dealers in the use of the analysis and has shown the relation between the various factors involved. This analysis probably is not the last word on the subject, but it is far in advance of the methods common to truck selling to-day and constitutes an excellent example for study.

There are two main heads in the transportation analysis developed by this company. They are:

1. Basis of analysis; items to be known and considered.
2. Method of procedure.

The first division has to do with determining the conditions under which the truck will have to operate, the material it will haul, etc. The second division relates to the type of truck best adapted to the conditions outlined and the exact cost of operating that truck. The various divisions of the two main heads are worth discussing in detail.

The first division under the first head is the material to be hauled. Concerning this factor it is necessary to know the kind of material and the quantity in which it is to be hauled. It is also necessary to know the methods used in assembling the material for loading. It

often happens that inefficient methods of assembling the material increase trucking costs materially. This concern takes the attitude that the truck salesman should understand every factor affecting trucking cost, whether it relates directly to the running of the truck or not. Thus, if the salesman finds that the assembling of material is not being done in an efficient manner, he is expected to point out to his prospective buyer how those conditions can be improved.

Then road conditions must be studied. These will have a direct affect upon operating costs and consequently must be understood by the salesman before attempting to solve the particular transportation problem.

Next comes the problem of loading conditions. Loading devices may be applicable which would reduce appreciably the loading time and cost. The load must be assembled in the best possible manner taking into account loading and unloading time as well as safety of the load during driving time.

Routing conditions must be analyzed. The number and place of stops, the unloading conditions and the laws restricting unloading conditions all come in for consideration. The distance of the trip to be made constitutes another factor, while garage conditions are also important. The distance of the garage from the starting and stopping point of the regular runs is an important factor in operating costs, while the equipment of the garage will have an effect upon the way in which the truck will be serviced. All of these items, then, are to be known and considered before attempting to tell the man what truck equipment he should buy. Presented in outline form they appear as follows:

1. Items to be known and considered.
 - A. Material to be hauled.
 - a. Kind and quantity.
 - b. Assembly of material.
 1. Plant conditions.
 2. Can they be improved?
 - B. Road conditions.
 - C. Loading conditions.
 - a. Loading devices.
 - b. Load assembly.
 1. Plant arrangements.
 2. Devices for efficiency.
 - D. Routing conditions.
 - a. Routing of stops.
 - b. Unloading conditions.
 - c. Laws restricting unloading.
 - E. Trip distance.
 - F. Garage conditions.
 - a. Distance from loading point.
 - b. Conveniences for working.

This brings the analysis to its second stage, termed in the Selden outline, "Method of procedure." Under this head there are two main factors, namely, operations and

cost. Seven points are to be considered under "operations."

First the salesman—or transportation engineer, as he should be in fact, if not in name—must determine from the facts already considered the proper size of truck and type of body best adapted to economical operation under the given conditions. It will immediately be objected that this is easier said than done in many cases. That is true, but the salesmen of this truck are being materially assisted by a weekly data service which present them with actual figures and experiences of trucks already in use. This service is discussed more fully later in the article.

The next factors are the standing time and the running time. In connection with the former, loading and unloading time must be found, while the type of load and road conditions will be determining factors in the latter case. Then the total time for the various trips must be determined. From this can be computed the number of possible trips during each day. In making this computation delays should always be allowed for and the traffic conditions of the trip may have to be analyzed to determine what that allowance should be. The allowance for delays is analogous to the allowance made in time study work. The scientific analysis determines the theoretical possibilities of perfect performance and then allowance is made in the light of practical difficulties and experience.

The amount of material that can be hauled is determined. This quantity is given in barrels, gallons, pounds, tons, board feet, or in whatever units are common to the industry of the prospective purchaser. This is a point not always recognized by truck salesmen. The purchaser is interested in how much of the material he deals in can be carried, and he is used to gaging amounts of that material in certain units. To tell a lumber man that the truck will haul six tons a day does not give him any mental picture of what is to be accomplished. The Selden company tells more than one story of sales gained or lost through failure to recognize this comparatively small factor of sales psychology.

Then the actual work done by the truck is determined. This work is usually expressed in unit miles, i.e. that number of units multiplied by the number of miles those units are carried. The actual computation is not made on this theoretical basis, however, since it has been found that practical contingencies render it improper for actual use. The rule used is as follows: "To determine a unit mile when loads are carried one way only multiply total loads carried by one-half the round trip distance. . . . To determine a unit mile when loads are carried both ways multiply total loads carried by actual round trip distance." The latter case, of course, is in accordance with the theoretical rule.

Special care is always taken to explain fully what a unit-mile is, since many purchasers are not familiar with the term and its usage. Often, in fact, it is advisable not to insist too strongly on this terminology where the prospective purchaser is unfamiliar with it. This completes the first section of this second main division. In tabular form its looks like this:

II. Method of Procedure.

A. Operations.

1. Determine from previous facts proper size of truck and type of body most economical.
2. Standing time; loading and unloading.
3. Running time; depending upon load and road.
4. Total trip-time.
5. Trips possible each day.
6. Amount of material hauled.
7. Number of unit-miles; work actually done.

After this careful analysis has been accomplished it is possible to figure the probable costs of operation. These must in turn be analyzed and subdivided so that the prospective purchaser may know accurately what to expect in the way of truck transportation costs. The first factor under cost is that of investment. This item includes cost of chassis, body, cab, freight charges, war tax, etc. It will be noted that the truck man has already done a great deal of constructive analysis work for the benefit of the prospective purchaser before the matter of original investment is discussed. This is proper not only from the standpoint of sales psychology, but also from the standpoint of good transportation. The initial investment—or any other costs for that matter—can be properly visualized only in their relation to other factors of transportation.

Next to the original investment come the fixed charges, the charges that must be expected continuously. These charges include interest on the original investment, insurance, garage, taxes and license. They are computed on a per year and per day basis. The transportation engineer in any territory must be thoroughly familiar with the insurance, garage and tax rates in that territory, as well as with the details of all the laws regarding trucks. Liability, fire and theft, collision and property damage insurance are included in the cost analysis, although the items are separated so that the prospective purchaser may eliminate any that he feels are unnecessary in his particular case.

Then there are the variable charges. These are computed on a per mile basis and include fuel, oil, tires, maintenance, depreciation. Here again the data service comes to the aid of the salesman in aiding him to determine accurately the variable charges in a particular case.

Drivers' wages are included as a separate item. Then the total cost of operation is computed and included as the final item under "cost." There are several steps in

Analysis of Selden Truck Operation and Costs	
Owner—Luger Furniture Co. Address—North St. Paul, Minn.	Business—Furniture Manufacturing Truck Capacity—2½ Ton ("A" Model)
Operation Records	
A—Total Period	B—Daily Averages
1. Period covered..... 8 mos.	12. Round Trips.....
2. Days operated..... 75	13. Deliveries—Pickups.....
3. Days out for Repairs.....	14. Quantity—Out.....
4. Total Round Trips.....	15. Quantity—In.....
5. Deliveries—Pickups.....	16. Total Quantity.....
6. Quantity—Out.....	17. Miles Traveled..... 50
7. Quantity—In.....	18. Miles per Round Trip.....
8. Total Quantity.....	19. Quantity per Trip.....
9. Miles Traveled..... 5750	20. Unit Miles.....
10. Gasoline—Gals. used..... 600½	21. Miles per Gal. Gas..... 9.2
11. Cyl. Oil—Pts. used..... 900	22. Miles per Pt. Oil..... 18.75
Cost Records	
C—Investments	E—Variable Charges—Period
23. Chassis Complete..... \$5500.00	40. Fuel at 30 cts. Gal..... \$ 180.15
24. Body..... 145.00	41. Cyl. Oil at 7½ cts. Pt..... 15.00
25. Cab..... 40.00	42. Tires—\$7.50 Miles..... 515.75
26. Painting..... 40.00	43. Depreciation—3,750 Miles..... 186.75
27. Special Equipment.....	44. Maintenance and Repairs (Est.)..... 75.00
28. Total Investment..... 5665.00	45. Driver's Wages..... 375.00
29. Tire Value—Pneumatics..... 675.60	46. Total Variable Charges..... \$1147.65
30. Total less Tires—to be Depreciated..... 5991.40	47. Total Fixed Charges..... 105.59
48. Total Operation Cost..... \$1653.04	
D—Fixed Charges—Yearly	F—Daily Costs
33. Interest on Total Inv. @ 6%..... \$ 310.00	49. Cost per Day Operated..... \$16.70
34. Taxes and Licenses..... 1.65	50. Cost per Mile Traveled..... .334
35. Insurance..... 80.00	51. Cost per Unit Hauled.....
36. Garage Expenses..... 120.00	52. Cost per Unit—Mile.....
37. Total Per Annum..... \$491.35	53. Repair Cost per Mile—Est..... .02
38. Total per Month..... 35.18	54. Repair Cost per Mile—Actual..... .012
39. Total for Period 8 mos..... 165.30	
Note Carefully	
This 2½ Ton Selden has operated with another Selden to connect two factories which are 22 miles apart. With railroad switches at the doors the factories suffered heavily because of four day trip necessary for shipping. The trucks have reduced this to a 3 hours trip, travelling an average of 50 miles per day at the cost of \$10.70. A remarkable low rate to pay for the services obtained. The total repairs for the 75 days was \$45.00 although an estimate of 2 cents per mile or \$150.00 was set.	

determining this total operation cost. First, the total variable charges are multiplied by the total miles traveled. To this are added the total fixed charges and the total drivers' wages. The result obtained is the total cost per day. From this the total cost per mile and per unit-mile can readily be computed. For greater clearness the various factors under the second division of "Method of procedure" may be tabulated as follows:

B. Cost.

- a. Investment.
- b. Fixed charges; per day and per year.
 1. Interest on investment.
 2. Insurance.
 3. Garage.
 4. Taxes and license.
 5. Total per year; per day.
- c. Variable charges; per mile.
 1. Fuel.
 2. Oil.
 3. Tires.
 4. Maintenance.
 5. Depreciation.
 6. Total per mile.
- d. Driver's wages.

In working out these costs, depreciation is figured according to the following rule: "To find depreciation per mile subtract cost of tire from total investment and divide this result by estimated life of truck in miles." Obviously there is room for variation in nearly every factor mentioned throughout the entire analysis. The aim, however, is to render the figures as nearly truthful as possible, for the cause of transportation—in which every truck manufacturer has a vital interest—is greatly injured every time inaccurate figures are given; figures which promise more than subsequent operation proves practically possible.

The advisability of trailers is also a factor to be considered. When they are necessary the type must be determined and 15 to 30 per cent added to operating costs.

Such an analysis as the foregoing, however, provides a sound basis upon which to base an accurate estimate of future performance, and indicates, as well, the factors to be considered in calculating past performances on the basis of actual records. There is great need in the industry for more data concerning truck operating costs under various given conditions. Such data can be compiled only by careful investigation over a long period of time and by many manufacturers. Some such system of transportation analysis, if taken up by a large number of truck manufacturers would accomplish several things, each important to progress:

1. It will build a permanent business for the manufacturer; it will enable him to sell more of his own trucks.
2. It will bring the motor truck more favorable notice as a real economic factor in transportation.
3. It will develop the use of trucks in a sound and economic manner.
4. It will make for the permanent progress of the truck industry as a whole.

The weekly data service used by this company has been mentioned. This service is of interest because of its function in connection with the foregoing transportation analysis and also because of its part in building up data on truck operating costs. Its points of contact with the transportation analysis have already been indicated, but the system itself has not been described.

Weekly Data Service

From all parts of the country the Selden company collects information concerning the performance of its trucks in various industries. The company asks men

who have been operating the trucks to write a few brief paragraphs concerning the conditions under which the truck has been performing, the type of loads it has been carrying, the routes it has been making and various other details of its performance.

In addition to this, it procures from the man operating the truck operation and cost records. This analysis sheet has two purposes. First, to provide a suitable form upon which the operation and cost data of Selden trucks can be tabulated as received from owners, presented to prospective purchasers that they might profit by the experience of the owners.

Second, to provide a suitable form upon which to list the various items of operation and expense which would be incurred by the prospective purchaser, if a Selden was put to work.

This material is all practical and accurate information. It should not be confused with the ordinary house organ "performance stories" which are so common. These are detailed studies of trucks being operated in various industries, of trucks performing regular routine hauling jobs.

Each week all dealer salesmen receive one of these data sheets; each week their files of data grow and on the basis of the figures and performances recorded elsewhere they are aided in making new analyses.

This does not mean that the figures of one performance can be used to predict costs in another case. Thorough analysis of each individual case is essential, but the general aid rendered by such a service can be easily understood. A sample of one of the analysis sheets which comprises part of one week's data service is shown in the accompanying cut. The value of data of this kind grows as more of it is accumulated and the value to the industry will grow as more companies begin to gather it.

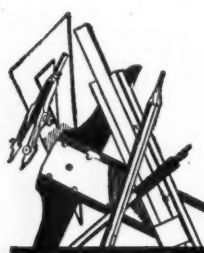
Number of Automobiles Licensed in Great Britain

PARTICULARS issued by the Ministry of Transport indicate approximately the number of automobiles in use in Great Britain on May 31. The figures given apply to the number of vehicles for which licenses have been taken out and are issued primarily in connection with a return showing the yield of the new motor tax from Jan. 1 until May 31. This tax, which is applied in one form or another to private passenger cars, trucks, motorcycles and hackney carriages (otherwise public passenger vehicles) yielded £8,436,000 (about \$42,000,000). The number of vehicles licensed during the period mentioned as compared with the year ended March 31, 1920, was as follows:

	1921.	1920.
Private Passenger Cars	212,000	185,700
Motorcycles	370,000	278,600
Public Passenger Vehicles	95,300	71,400
Trucks	16,000	No Record
Agricultural Tractors	10,160	No Record

In arriving at the 1921 figures allowance has been made for the fact that in the case of private cars and public passenger vehicles quarterly licenses were taken out in some cases.

As giving some indication of the average horsepower of private passenger cars in use, the average yield of tax per license is of interest, for the tax in this class is at the rate of £1 per horsepower. The average yield per license was £17 6s, which indicates that the average horsepower is 17.3 by the rating adopted, namely .4D²N where D equals the diameter of the cylinders in inches and N the number of cylinders.



The FORUM



Variations in Tread

Editor, AUTOMOTIVE INDUSTRIES:

Referring to Mr. David Fergusson's letter in the Aug. 4 issue of the AUTOMOTIVE INDUSTRIES, there is little doubt that the 56 in. tread for automobiles was taken from the 56 in. standard wagon tread of the North, and his own statement that for fifteen years he has used this tread seems to establish this, and it is difficult to see how the standard was derived from the railroad tread.

As a matter of fact, the railroad tread was derived from the standard 56 in. carriage tread which was in use many years, both in this country and England, before the railroad was even dreamed of.

The suggestion that the 56 in. tread should be adhered to because trolleys have this tread is also equally bad, for if this tread is adopted and the automobile run on the trolley rails it is absolutely the worst tread that could be adopted, as the tires are apt to get badly worn and cut, as pointed out by Mr. Fergusson, as **both wheels** tend to run in the groove of the rail instead of on the flat surface. If slightly wider at least **one wheel** will run on smooth surface.

If any one will take the trouble to measure the width of the trolley rails to the **center of the flat surface** this will be found to be about 58½ in., and if the automobile was made with this tread **both wheels** would run on smooth and flat surfaces, except when crossing switches, and the tires would be preserved instead of being worn, and for this reason the writer in 1904 made 58½ in. as his standard tread (long before any automobile standards were adopted), for in those days, before there were any hard roads outside of the cities, running on trolley rails was oftentimes not only desirable but necessary for miles at a time.

The fallacy of a 56 in. standard is shown by Mr. Fergusson's own statement, that so prominent a company so easily departs from it, and if this is to be done it is just as easy to vary half a foot as half an inch.

Neither is it a fact that the dirt and clay roads have distinct ruts (except in the engineer's mind) until they are created or produced by the engineer's creation of a standard tread, as pointed out in my previous letter, and for this reason, if none other, should be abandoned. If it were possible the groove of the trolley rail would be made as large as the deepest rut of a dirt road.

Further, it is not a fact "that on hard roads almost every part of the road is traveled and there is no necessity for varying the tread" and many improved state roads have signs, "Do not travel in the same rut." As previously pointed out, until we had the cement or concrete road we have never been able to make an "improved" road that would not go in ruts where standard treads were used.

The advantage of varying the tread does not apply so much to hard roads as Mr. Fergusson seems to think in his reference to paragraph 21 as it does to soft roads as pointed out in paragraph 22.

Neither was it suggested to make cars (automobiles) 65 in. or 70 in., but from 48 in. to 63 in., as stated in paragraph 20. The wider tracks referred to trucks and

they exist to-day on the 3, 5 and 7 ton trucks and even if they are not 70 in. to the center of the wheel, on solid tires, they are more than this to the outside of the flat portion.

As Mr. Fergusson points out, "Unfortunately many of the latest improved highways are almost too narrow for cars of 56 in. tread," but this doesn't take the 65 in. to 70 in. tread trucks off the road, neither will it keep them out of the garage.

Admittedly the car would be much improved in appearance and have a better balanced appearance by being considerably narrowed in body width and vice versa—so long as the wider exists the same would apply to a wider tread; one is as logical as the other, and perhaps as easy to bring about, and it is up to some automobile maker to have the courage of his convictions and boldly adopt say a 60 in. tread or a 10 in. narrower body.

Either would have the same advantages as regards the problems of body construction, disappearing windows, appearance, riding qualities, mud guards independent of the body, etc.

In regard to external and internal brakes it is, I believe, a fact that not one European car or American truck is fitted with external brakes, and even the Pierce-Arrow trucks, which are of later design than the car, have this distinction. If internal brakes become inoperative from oil this could probably be overcome by an improved method of preventing the oil from escaping from the axle and certainly want of contact of surface is due to bad design. The difference in surface between an external and internal brake applied to the same diameter of drum only 3/16 in. thick is not so much. External brakes drag 75 per cent of the time more or less and, as pointed out, the soft braking material quickly cuts out. W. J. P. MOORE.

More Accessible Emergency Brakes

Editor, AUTOMOTIVE INDUSTRIES:

I have been reading with much interest the recent discussions on four wheel brakes, as set forth in the Forum, and I should like to add another feature pertaining to braking and brakes. The great majority of car builders seem to be constantly overlooking the emergency brake.

It is almost a physical impossibility for the average driver to reach the emergency brake handle, since it is usually hidden under the dash, when occupied with one foot on the clutch and the other foot on the service brake, looking forward trying to avert an accident. It is in time of danger that such an important thing as an emergency brake should be within easy reach.

Less than half a dozen manufacturers have arrived at any definite improvement over the old style hand brake, which is usually difficult to reach in case of an emergency.

Generally speaking, the service brake bears the brunt of the braking effort applied to the rear wheels, and it is true (as Mr. Moore says) that about 75 per cent of these brakes are either dragging or are loose; what then about the emergency brake?

The active part of the emergency brake now seems to have degenerated into a wheel-lock used to keep the car

from moving while parked on an incline, but most drivers shift into reverse to utilize the braking power or inertia of a dead motor.

I have done some remodeling of brake handles on several makes of cars and I find that by cutting off the shank immediately above the pivot pin hole and welding in enough material to lengthen the handle to any desired height it may then, by bending it to conform to the dash, be placed within easy reach of the driver. The release rod and catch are operated the same as before with an extension welded into the rod. The action of the handle is improved by the additional leverage and so adds both a mental and physical security to the driver. It is surprising to note the psychological effect obtained by this simple remodeling, as shown by count of the number of times this remodeled brake handle is brought into use compared with its more obsolete form. This naturally results in a decrease in the constant wear on the service brake band.

I should like to hear from some of the manufacturers as to why some such changes are not made in the prevailing emergency brake handles; is it the cost of the change or pure negligence and indifference?

R. W. ORRELL.

Some Features of Body Design

Editor, AUTOMOTIVE INDUSTRIES:

The letter of Mr. W. J. P. Moore in the *Forum* of July 28, mentions the capacity of the rear seat. Speaking from the body builders' point of view, we know that the rear seat cannot be made to accommodate three adults comfortably, with 56-in. tread, but we do know that the public, including the majority of special body buyers, insisted on the maximum seating width at the rear. With the increase in the number of bodies that eliminate the folding seats, the necessity of the additional seat room is greater than ever.

The writer received an inquiry from the Pacific coast last week asking if we could build a coupé body with room for three on a straight seat across. Think of what that means. The driver sitting back of the wheel occupies one-half the body width and by some magical means, the body builder is expected to arrange for seating two persons comfortably on the remaining half of the body.

Mr. Moore mentions 20 in. as the space for each person, but 17 in. is the maximum allowed by body builders, and public conveyances sometimes allow only 16 in. The maximum width on an open body rear seat is 51 in., and as the shoulders of those seated at the sides can extend beyond this, a fairly comfortable seat for three can be arranged. On a closed body the maximum seat width is 48 in. To seat three, a pillow may be used in the center that will put the shoulders of the middle passenger forward of those at the sides. This will be a very acceptable seating arrangement for most people.

The stock body furnished by the car manufacturer may at times be carried over to suit material on hand and manufacturing conditions, but as a rule manufacturers, except those who build the very cheap car, change the body models each season to incorporate the needs that their experience with the trade during the preceding year has taught them. The writers' experience as stated above, is that even the special-order bodies must seat three at the rear.

In paragraph 11 Mr. Moore suggests that all seats except the driver's seat be made movable and capable of being adjusted to suit different occupants. This has been tried in various ways and one manufacturer featured such an arrangement at the New York show a few years ago. The majority of car users do not take kindly

to anything that is adjustable. They don't want to even fold down the touring body top. All folding-top body designs except the cabriolet have been eliminated, and the cabriolet is used in limited numbers. Removable sides can be used to convert the California top into a closed body, but this design, which has excellent and substantial features, has not taken hold to the extent that was anticipated, due simply to the inherent dislike of the public to be troubled with mechanical devices that mean work, at a time when they look forward to doing nothing but drive or ride in the car. They will change a tire because there is no other way out, but the writer's experience has proven it better to leave all convertible and mechanically operated arrangements out of the body that you can possibly do without.

In paragraphs 12 and 13 Mr. Moore speaks of the seats and trimming. The idea of air cushions being a substitute for those now used may have commercial advantages. The increased tendency to roll would prevent the use of a single air bag, but the possibility of air cushions would be feasible if the cost can be made low enough.

As to paragraphs 15 and 16 the writer agrees with Mr. Moore that some plan of mounting the body and carrying it suspended, so that the distortions of the frame are not communicated to the body as shocks would be an advantage. The writer outlined a suggestion on this line in the June 16th issue of the *AUTOMOTIVE INDUSTRIES*. The advantage of some form of construction there outlined would be to eliminate the squeaks of the body and frame contact and permit the body to ride more evenly and without distortion from the frame.

GEORGE J. MERCER.

Engine Cooling

Editor, AUTOMOTIVE INDUSTRIES:

Mr. Ludlow Clayden's remarks on "Improved Engine Cooling" in the July 28 issue are of interest. I am in the main in agreement with his comments in the engineering number regarding the relative positions of air and water cooling.

To state, however, that the present position of the air-cooled engine is analagous to that of the two-cycle engine is a deal more amusing than accurate. The success of the Franklin car I think demonstrates that air-cooling is by no means as undeveloped as suggested.

Mr. Clayden apparently entirely ignores the progress that has taken place in Europe with the large air-cooled aircraft engine cylinder, although it is admitted that the reports seem exaggerated to those who have not witnessed the results. However, it is but a matter of a short time before it will be demonstrated with cylinders of domestic origin that such reports are not flights of fancy and that claims to equality of brake mean effective pressure and of exhaust valve reliability, with the best water-cooled engines have some foundation in fact.

Mr. Clayden rightly says that the air-cooled engine is not waiting for any great invention to aid in its development. Its development in Europe has been the result of common sense and extensive careful research, the cylinders having been to all practical purposes designed on the test engine.

The lessons learned from the high-efficiency water-cooled engine are in the main applicable to the air-cooled engine if due allowance be made for the variation in the specific heat of the cooling medium. S. D. HERON.

BOTH the Dutch and the Belgian governments publish at intervals lists of articles which may not be imported into the respective countries. The latest lists do not include any products of the automotive industry.

An English View of American Industrial Relationships

Two keen British observers visited America recently, and, after returning to England, made some interesting comments regarding American industry. A few comments by Mr. Tipper serve as a background for their remarks. The labor problem is prominently discussed.

By Harry Tipper

IT is interesting at all times to see ourselves as we appear to other people, and particularly when the conclusions of the visitors are complimentary to us. Mr. E. J. P. Benn and Mr. F. Elliott recently reported to the Industrial League and Council of Great Britain their impressions of the United States, particularly in regard to the industrial development, after a visit to this country.

Their impressions were recorded in the *Daily Telegraph*, and there are many suggestions in the statements they made.

Viewed in this way, it is obvious that the conditions in the United States are so much better than conditions in the most stable European countries, that the troublesome difficulties are really very small in comparison.

Some comment should be made upon the statement as to the differences in the attitude of labor in this country and in Great Britain.

The long history of union development, the homogeneous character of the people, and their tendency to remain in one place have accentuated the political tendencies toward socialism by the very increase of uniformity in the course of these developments.

We are fortunate in this country to have a different standpoint, but the development of trade union, uniformity of pay, and uniformity of operation lead inevitably toward uniformity of production pace in the last analysis.

The great difference in the ownership of houses by the workers in the two countries is perhaps the most important difference in influence. The vast majority of workers in Great Britain do not own their houses and the possibility of ownership is hampered by the old land laws which still exist. The workers, therefore, have no stake in the stability of the country. The ownership of real estate demands a stability and safety not otherwise visible in their necessity to the worker.

Where rent is paid weekly, and all the items are weekly, and there is no visible connection between the worker and the community, there is less hesitation about employing experimental ideas and there is a more general tendency to radical movements.

Mr. Benn and Mr. Elliott are able men, close and keen observers, and the following comments on our industrial conditions are repeated here as worthy of attention:

Mr. E. J. P. Benn said he was in America five weeks—just long enough to appreciate that fifty years would be insufficient to grasp all that America had to teach one.

But upon one point he could be definite without any qualification; the need for the closest understanding between the English-speaking peoples as

the means of saving the world for civilization was recognized by the Americans with a depth of conviction which rivalled, if it did not excel, our own.

He confessed that he had returned a more confirmed individualist than when he set out. Could they imagine a land of 110,000,000 civilized persons without a political labor party; a land in which the workers, who had never heard the words "ca' canny," regarded restriction of output as a mythical madness? The policy which was known here as "9d. for 4d." was there expressed as "nothing for nothing." The differences between ourselves and our American friends in these industrial questions were so fundamental that little use could come from the discussion of matters of detail.

That veteran leader of American labor, Mr. Sam Gompers, claimed that so far from being fifty years behind England in matters of labor organization, America was 100 years ahead. He claimed that to estimate the success of a labor movement one must not judge by the violence of its political programme; a more effective test was to go to the homes of the people. Mr. Gompers pointed with pride to the 6,000,000 working-class homes which were either completely or partially owned by their workmen occupants; to the 12,000,000 automobiles among 110,000,000 people; and to the 15,000,000 owners of shares or other forms of property which existed in that wonderful country.

America, like the rest of the world, was having her revolution, but there it was taking the form of a transference of large blocks of industrial capital into the hands of the workers in industry. The most striking example was the Ford Works, where the workmen owned no less than \$6,600,000 worth of the company's stock. The force of this movement was further shown by the fact that savings banks at street corners were more numerous in America than public houses at street corners here. Mr. Gompers claimed that he was leading the only constructive labor movement in the world.

The whole force of public opinion in America, said Mr. Benn, was directed to teaching its people how to push, while here it seemed to be concerned to teach its people how to lean.

Having expressed the view that the vast accumulation of wealth in the U. S. A. would not flow to Europe as it should do until Americans regarded Europe as a safe place for the investment of money, he said that an American Senator told him that America looked with some apprehension on the light-hearted way in which we appeared to be conducting great and novel economic experiments, particularly in the matter of legislative enactments. This

Senator gave the following list of British inconsistencies:

- (1) Our demand for German indemnities and our refusal to take German goods;
- (2) Our need for industrial activity and our taxation, which, to an American, spelt nothing but industrial murder;
- (3) Our depleted wealth and our bragging of a higher standard of living;
- (4) Our centuries of economic experience, and our flippant economic legislation, which appeared to be enacted and repealed with equal regularity and levity;
- (5) Our surrender to lassitude, the natural result of the war, and our self-infliction of doles and dope which must inevitably accentuate the trouble.

In Chicago, proceeded Mr. Benn, he heard a speaker tell a brotherhood meeting of 2500 men that "no power in Heaven or in hell can prevent America from assuming the leadership of mankind." "I am here to say that is true," said Mr. Benn, "if we are going on in the way we have followed during the past couple of years. But if we can succeed in taking advantage of the one thing we have which America has not—the one thing which has given us the trade unions and other blessings; if we take advantage of our genius for organization and turn it to constructive instead of destructive purposes, then America can do all the leading of mankind she likes; she will have to come here to learn how to do it."

American wages were roughly two and a half times those earned in this country, but it was erroneous to suppose that American labor costs were dear. American labor, as a cost factor in production, was among the cheapest in the world. He watched a man earning 7s. 6d. per hour tending three machines, which in this country would each have required a minder and a laborer to care for.

If it were true that we had to face the consequences of cheap German labor we had also to face the good, healthy, straightforward competition of efficient, hard-working, economic American labor.

The theory that America was the land of the "Almighty Dollar" was true, but all depended upon what one meant by the dollar. The impression of Americans as a grasping, materialistic crowd of moneymakers was altogether beside the mark. We understood neither America nor the dollar. While we groveled in the depths of sophistry, getting more and more miserable as we failed to find the philosopher's stone in the shape of some mystic new system, the streets of America were thronged with happy, optimistic people who talked a great deal about dollars but more about service. Most mysterious of all, one found the two words used in association.

The American, being a sound economist, recognized that the proper measure of service was not that put upon it by the man who rendered it, but the measure calculated by the one who received it. The only measure which the receiver of service could use was the dollar, which explained America's attachment to it.

The underlying inspiration, the thing which gave the cheery life which characterized that wonderful people, was not the dollar, but service. The Declaration of Independence gave to the American citizen the right to life, liberty, and the pursuit of happiness; he found happiness, satisfaction, self-respect, and independence in doing good and useful work; in rendering service.

Mr. F. Elliott, who also replied, said the deepest impression that he formed of America was that it was a nation of capitalists. The country's wealth was rapidly passing from the hands of the big people into the hands of the many, and that transference

was being welcomed by the big leaders of industry, who saw in it a bulwark for civic stability and industrial stability.

When referring to the packing houses in Chicago, he said that Swifts had 40,000 shareholders, which included 14,000 employees. The shareholding averaged thirty-seven shares per individual, and it would require 900 shareholders to pool 51 per cent of stock and exercise control. In some firms bonds were purchased on the instalment plan, a system that would be good in this country.

The standard of living and dress was higher among the workers in America. In Detroit there was one motor-car to ten inhabitants. Here it was one to ninety-five inhabitants. Few signs of poverty were to be seen. Prohibition seemed to have been a good thing; it was certainly better to have the savings bank at the corner of the street instead of the public-house. He did not know whether it was due to prohibition, but America seemed to have passed through her industrial crisis with comparatively little trouble in the way of resentment, or poverty, or strikes. They had accepted wage "cuts" in a philosophical fashion. While he was there the steel-workers' wages were cut by 20 per cent. They studied and understood economics in America.

Rather than see the works of the American Manganese Company—which supported thousands of people—closed, the workpeople and directors met, and there was a voluntary offer to accept a cut of 40 per cent in wages. The directors agreed to that, and in return they agreed to reduce the rents of the houses in which the workers lived by 40 per cent.

Then the shopkeepers agreed to reduce the prices of necessities, a most practical effort at co-operation in bringing down prices. They had no old age pensions and unemployment schemes. The Secretary of State for Labor told him and his colleague that they thought the people of England were being pauperized by their methods of social reform.

The American worker said, "Give me the highest possible wages, and in return I will give you the highest possible output and look after my own old age pension."

The American was no more enamored of the bureaucrat than we were in England. He had a slogan, which Mr. Hoover invented, "Less Government in business and more business in Government."

ENGLISH aircraft papers report that owing to the steadily increasing use of the air mails the German postal authorities have found it necessary to establish a main aerial post office in the Konigstrasse, Berlin, in order to be able to properly handle the mass of aerial mail which leaves Berlin daily in connection with the regular air services.

The German Government now grants a subsidy of ten marks per kilometer to exclusively German companies for flights less than 250 kilometers and eleven marks per kilometer for flights exceeding 250 kilometers.

The official stipulations, however, require each subsidized company to declare its daily services in advance and to undertake the carrying of mails and passengers. Connections at specially indicated railway stations in order to link up with the railway expresses are also insisted upon, and every effort has to be made to link up with the international air services flying through Germany and making use of German aerodromes.

In regard to the occupied zone, motor bicycles carry the mails and passengers from the nearest points at which German aircraft are permitted to land by the Inter-Allied Air Commission.



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Truck Overloads Prohibited

THE tendency of users to overload trucks has been one difficulty met in truck merchandising. Truck transportation units often have failed to perform effectively in a given case because of continual overloading. Such failures, although not justly attributable to the truck manufacturer, have reacted against him because the user failed to understand the real cause of the poor truck performance.

Certain provisions of the Connecticut motor vehicle law are interesting in this regard. A complete file is being made in Connecticut of every commercial motor vehicle, its model number, type and carrying capacity. Motor vehicles are taxed according to total piston displacement and according to carrying capacity. To carry out this provision, Section 32 of the law prohibits the operation of an overloaded motor vehicle. A commercial motor vehicle, therefore, cannot be operated in Connecticut beyond the carrying capacity or rating of the manufacturer.

If such a vehicle is found on the road overloaded, the operator is arrested and prosecuted under this sec-

tion of the law. The state officials do not allow a two-ton motor truck to be rated as a three-ton truck simply because of the addition of a few spring leaves. To facilitate the operation of law, Section 42 requires that the maximum capacity, light weight and maximum speed in miles per hour be painted on the side of each truck.

This is one case, at least, where the state law would appear to operate to the advantage of the truck manufacturer in compelling the sensible loading and use of a truck of a given capacity.

Variation of Power with Compression Ratio

THAT the mean effective pressure and the maximum output of an engine increase with the volumetric compression ratio used is well known, and in practically all engines the compression ratio is made as high as the character of the fuel to be used and the conditions of operation in the service for which the engine is intended permit. There is a theoretical formula for the variation of the mean effective pressure with the compression ratio, namely,

$$\text{m.e.p.} \left(\frac{1}{r} \right) \gamma - 1$$

in which r is the compression ratio and γ the ratio of specific heats, which latter for air has the value 1.41.

There is comparatively little experimental data available to substantiate this formula, because it is seldom that two engines are built exactly alike except for the compression ratio. It would be absolutely futile to try to substantiate or refute it by means of data from engines varying also in other respects, as the mean effective pressure is influenced by many other factors. Some years ago, however, the Benz company of Germany made tests on an aircraft engine with successively increased compression ratio, starting with a ratio of 5 and ending with 5.8, and the results obtained in these tests afford a means of checking the formula. In order to prevent preignition and knocking at such high compression as that corresponding to the ratio 5.8, benzol was used as fuel. The tests were even extended to cover the case of a compression ratio of 6, but it was then found impossible to prevent preignition, and the power fell off for all speeds.

For an increase in compression ratio from 5 to 5.8 the above formula indicates an increase in mean effective pressure of 6.3 per cent. In reality the increase was 16 per cent at 1600 r.p.m., 14.5 per cent at 1500 r.p.m., 12.5 per cent at 1400 r.p.m. and 10.9 per cent at 1300 r.p.m. That the increase should be greater than the theoretical is easily explained, because theory takes account only of the increase in pressure or directly due to the higher compression and neglects the gain due to the reduced cooling area. It is also clearly shown that the gain in power due to the increase in compression ratio is greatest at the higher speeds. For all speeds, however, the peak of the m.e.p. curve seems to lie very close to a compression ratio of 5.8 (for this particular case). The rate of

increase in m.e.p. with increase in compression ratio increases at first, then decreases and for a compression ratio of 5.8 becomes zero, while beyond this point the m.e.p. decreases. For gasoline the optimum compression would, of course, be lower. But the conclusion seems justified that for each design of engine operating on a particular fuel there is a compression ratio which gives the highest m.e.p. at all speeds, and that for lesser compression ratios the m.e.p. and the power output drop more rapidly than the theoretical formula would indicate.

A Fool's Paradise

FEW men are better informed regarding the automotive fuel situation than H. Foster Bain, Director of the Bureau of Mines. In complimenting us for articles on the fuel situation which recently appeared in these columns, Mr. Bain says:

"I agree with you that it is not desirable to emphasize the impending scarcity to a point where people get nervous. We will find some way to supply what it is necessary to have when the time comes. It is well, though, that the industry should appreciate the difficulties that will have to be faced and not rest in a belief that the future will be as easy as the past."

Is the industry going to heed the advice of those who have made a thorough study of the fuel situation and take steps to economize in the use of remaining petroleum resources by building apparatus better suited for their efficient utilization, or will it prefer to live in a fool's paradise until the pinch comes and business suffers correspondingly?

Some far-sighted companies are looking ahead and planning their research work accordingly. Others continue to turn out apparatus, which is not only wasteful of fuel but gives trouble because no serious attempt is made even to vaporize present-day fuel, which is temporarily better than it was a year ago and far more volatile than it will be in the not distant future. This seems incredible if they realize that there is such a thing as a fuel problem.

Shows and Congresses

A METHOD which is being successfully used in France for stimulating interest in new industrial developments might be profitably adopted in this country. Over there industrial shows are combined with so-called "congresses" at which are presented papers on the technical and economic problems to which the new development has given rise. Two such international congresses were held in Paris during the early years of the automobile industry, and no doubt helped materially in securing for France that pre-eminent position in the manufacture of automobiles which she enjoyed for a long time. Such international congresses are particularly opportune in the early stages of an industry when the movement in any particular country is not sufficiently advanced to be self-sufficient and when the people engaged in it are still eagerly looking across national boundaries for ideas and suggestions. But the plan can also be carried out on a national basis, as was shown on the

occasion of the Columbus tractor show last winter. At the meetings in Columbus it was quite obvious that the persons attending the conferences were very eager to learn, and had it not been for the poor acoustics of the hall in which the meetings were held the attendance would have been very good.

The average show visitor of the "ultimate consumer" type has only a very limited knowledge of the principles underlying the construction and operation of the apparatus shown, and while there is much information freely dispensed at the stands, it is not always of the character most desired by the visitor and, moreover, it is biased.

The French plan of international industrial congresses is, of course, materially different from the American plan of free lectures at industrial shows. The "congress" is partly independent of the show and its expenses are defrayed from dues paid by the members. Each member has the right to present to the Congress a communication on any of the topics covered by the program of the affair, and each receives in due course a copy of the printed "transactions." The aeronautical industry has reached the state where an international congress would meet with considerable support, and it is not surprising to learn that a congress will be held in Paris in October.

Market Research Methods

THERE are a number of very real dangers to be avoided in carrying out a program of merchandising research. Considerable emphasis is being laid upon such efforts in all parts of the industry and constructive progress is being made, but one point must be constantly born in mind. The object of merchandising research is to discover as accurately as possible the market for a given make of car or product and the best methods of selling that market. This object must not be confused with the mere obtaining of a formula or an answer that sounds plausible but does not bear close examination.

Final conclusions must not be based on insufficient evidence. Merchandising data are almost entirely lacking in the automotive industry at present, so that it will be necessary for some time to make temporary plans and adopt temporary policies on the basis of inconclusive data, as additional information is obtained. There is an immediate and practical value to be obtained from each bit of new marketing data that is gathered and compiled, but it will be necessary for a long while yet to carefully interpret the data so obtained in the light of the many variables and unknowns which still enter into the calculations.

Certain engineering and production problems have been puzzling engineers for years. Experiments and investigations are still going on in regard to these problems. Real merchandising research is comparatively a new development in the automotive field. Involving, as it does, the complex problems of human psychology along with other intangible and variable factors, final results cannot be expected in a brief time. Definite value can be derived from each step of progress when results are carefully interpreted and the relative value of the various factors understood.

Firestone Reaches Peak of 1920 Output

Average Production Over 28,500
Tires Daily With 50%
Less Workers

AKRON, Aug. 22—That which it has been freely predicted would never happen—namely, any of the major tire building companies of America returning to their 1920 records of peak production this year, has been accomplished by the Firestone Tire & Rubber Co. of Akron.

While other major companies in Akron are laying off men and curtailing tire production, Firestone has been adding men and steadily increasing production and this week had climbed back to an average production of over 28,500 tires daily which compares with the company's 1920 peak established a year ago last April, of 28,800 tires a day. The present Firestone record is 28,500 casings and 30,000 tubes daily.

Others Laying Off

In the face of the Firestone report of steadily increasing orders, both from dealers and manufacturers, Akron's other two leading tire companies are reducing production. Goodyear in the past three days has laid off 900 men and curtailed production commensurately and Goodrich has dropped from 16,000 tires daily to 13,000.

The significance of the Firestone status is the fact that Firestone has wrested the tire production leadership from Goodyear and Goodrich, although in the past it has ranked third in the line of major rubber companies, and has now assumed the world leadership in respect to gross production of automobile and motor truck tires.

Only 50 Per Cent of Workers

Another significant point is the fact that Firestone has returned to its peak production with slightly more than 50 per cent of its peak number of employees, and despite the fact that its factories are now operating on a basis of fewer hours of factory work a week. When Firestone reached the mark of 28,800 tires in April, 1920, it was running every department 24 hours a day and six days a week.

To-day Firestone is making the same production with a little more than half as many employees, and is running most of its departments only 18 hours a day on a six-day weekly basis. Most departments are operating two nine-hour shifts, and only a few are running three eight-hour shifts daily.

Goodyear up until the layoff of 900 men was turning out 25,000 tires a day. Steadily increasing individual factory efficiency, officials state, will mean only a slight modification of production, despite the heavy layoff of men.

The Miller Rubber Co. is operating on a basis of 4000 tires daily, as compared with a peak of 5200. The General Tire

& Rubber Co. of Akron is operating up to capacity and almost to peak production, making 1500 tires daily. Other smaller concerns are faring better than the larger tire building companies and are operating on a higher percentage of peak than Goodyear and Goodrich. The Goodyear peak was 31,181 tires and the Goodrich peak slightly exceeded 28,000 tires daily.

While other companies anticipate a slowing up of tire orders from now until next January, Firestone officials say they expect the present rate of business to continue, and are contemplating no production curtailment for several weeks at least.

Illinois Sales Will Exceed 1920 Totals

BLOOMINGTON, ILL., Aug. 22—Central Illinois automobile dealers report the volume of business this summer well ahead of the same period a year ago. Industries which were suspended last summer and fall are reopened in most instances and, while many are working with a reduced force as compared to the war period, there is a gradual increase in forces which is reducing the number of men out of employment and increasing the money in circulation.

With bumper crops farmers are becoming more cheerful. Wheat has been up to expectations and the major portion has been converted into cash. The money in most instances has been utilized in paying old obligations and in buying machinery and other necessities deferred from a year ago. The oats returns have been disappointing.

The corn crop promises to be the best in years. With the harvesting of the latter cereal the farmers will again be in a position to spend money and the men who handle tractors are preparing to interest them in a machine. Tractor demonstrations are being arranged in many sections in Illinois, which is a healthy indication of a revival in power farming business.

Chicago Rural Sales on the Upward Trend

CHICAGO, Aug. 19—Sales for August in Chicago and controlled territory are not as brisk as they were through July. There has been a decided falling off both in actual sales and inquiries. July business was unusually good, so that with the noticeable drop in sales business may still be said to be satisfactory. August this year compares favorably with the same month of last year.

The one bright spot as pointed out by Chicago distributors is the strong upward trend of rural business. Country dealers are finding more business than for many months, and the prospects are for fall business that will be very satisfactory.

Trucks are not moving, excepting for a light turnover of light machines. Tires are keeping up an active market and accessories are speeding up.

Manufacturers Say Business Is Better

Indianapolis Reports Reductions
Have Had Good Effect on
Sales Everywhere

INDIANAPOLIS, IND., Aug. 20—Reports from the various automobile manufacturers here show that business in the cars made in Indianapolis remains about the same throughout the country. It is significant to note that the reports show no particular territory far behind, with the exception of some sections of the south. Reports of sales made by dealers show that the eastern business is picking up slightly and the Pacific Coast sales appear to be a little stronger. No change has been noted in production schedules at the different plants. The H. C. S. Motor Car Co. now is working under its schedule of five cars a day. While some of the manufacturers here reduced prices with "mental reservations" it having been their private opinion at the time reductions were made that the result would be only a temporary increase in sales, they now have had time to see the result and they do not hesitate to say that the general reduction has stimulated business.

The sales forces here have been extremely active during the past week in an effort to cause August sales to equal the July sales. Present indications tend to point to an equal month with last month. The higher priced cars have had a good demand during the past week, which has heartened up the dealers considerably. Dealers in the Dodge, Chevrolet and Ford are confident there will be no slump during the month. This is considered remarkable in view of the fact that this is the big vacation month and hundreds of persons are out of the city. Accessory dealers also are having a good business, but it is not thought that this branch of the trade will equal the sales made in July. Tire dealers report a good business for August, but the volume will likely not be so large as in July, due to the cooler weather, they say, which has reduced tire wear.

PLAN TOLL HIGHWAY

CHICAGO, Aug. 24—Alfred E. Case, head of the brokerage firm of Case, Boyd & Co. of this city, is having plans drawn for a private toll highway between Chicago and Milwaukee, the road to be 200 feet wide and to be laid in six one-way traffic sections. The base of the roadway is to be of concrete with asphalt surface, if built as planned. Branch roads leading to the lake regions of Wisconsin are to be part of the system. Two of the six sections planned are to be for motor bus express; two to be operated as toll lines for private passenger cars and two as freight roads. A \$5,000,000 company has been organized with an authorized bond issue of \$10,000,000.

Cleveland Demand Far Above Average

Retail Dealers Believe August
Business Will Surpass
Same Period 1920

CLEVELAND, Aug. 22—Statements of retail automobile dealers here that after harvest sales this year are exceeding those of a year ago for the month of August is borne out by conditions in industries that sell to the automobile trade.

August according to local leading retailers is running far better than August, 1920. Now that the harvest is about ended the farmers are commencing to receive money for their crops; sales of automobiles are increasing in the rural sections around Cleveland. The demand in this city is far above the average for August in the past.

Steel Buying Better

Buying in the steel trade in the Cleveland district is better during August than it has been for many months. A large part of the buying is being done by manufacturers of automobiles, and this is taken as evidence that production will increase greatly in the fall. The buying movement in the steel industry reflects the low ebb that manufacturers have let supplies reach and also that it is generally understood that prices have reached rock bottom. Some of the newcomers into the automobile sheet field have made concessions of several dollars a ton to get trial orders.

The Wills Sainte Claire agency here, a newcomer to automobile row, reports that August business is running close to July figures, and that was a banner month. Floormen state that persons visiting the salesroom daily run from 60 to 100. There is a healthy interest in this car and the management reports that sales exceed expectations.

The cut in the price of the Hudson has greatly stimulated sales at the Stuyvesant agency—distributors of the Hudson and Essex. The price cut from present indications will send the record for August way above the average for the month and also will enable the company to do some nice business September, October and November.

Dodge Going Good

The Dodge car is still selling at the same clip that made July this year one of the largest months in the history of the local agency, which is now the Barnes Motor Co. This firm will sell around 250 cars in this city during August from present indication.

The Chevrolet agency, which started a whirlwind business with the last cut in prices, has not experienced a let down in August. Other agencies also report a healthy demand.

Additional evidence that business is healthy in this city came when directors of the White Co. declared the regularly

quarterly dividend of \$1 a share payable Sept. 30, to stock of record of Sept. 15. Sales of trucks, especially in July, have been of a satisfactory nature and because of the generally improved conditions, the directors felt justified in declaring the regular dividend. It became known here that the White Co. had reduced bank loans \$2,500,000 since March 31.

The Ohio Committee on Public Utility Information reports that a survey of power users discloses a good increase recently in production. Electric power consumption in Cleveland the last week in July was 14.1 per cent higher than during the first week of the same month, the totals being 8,773,926 kilowatt hours the first week and 10,013,931 for the last. Gains also were reported for Akron, Lorain, Warren, Dayton, Columbus and Cincinnati. Automobile plants are among large users of electricity.

Plants in Milwaukee Maintain Production

MILWAUKEE, WIS., Aug. 22—From the manufacturers' standpoint the automotive industries in the first half of August maintained, generally speaking, the production rate reached at the close of July. A few manufacturers of parts and equipment were successful in placing business on the books sufficient to warrant increase in working forces, but others made no headway or were obliged to make small cuts owing to extension of old orders due to somewhat lesser output by passenger car builders.

The situation is considered satisfactory, in view of the slight slackening of activity in some other centers. Locally there is no expectation of increased activity until the State fair season in the Middle West is in full swing and distributors and dealers begin to book new business on dealer contracts for 1921-1922 or retail orders. Farm demand, at present very slack, is counted upon to produce a revival as the harvest season comes to a close and stimulus is lent by agricultural expositions, State and county.

DURANT BUILDS SALESROOM

DETROIT, Aug. 22—Ground has been broken at Lansing for the Durant Motor Co.'s garage, office and salesroom for the display of the new Durant car. The cost will approximate \$30,000 and the building will be the property of the Durant Motor Sales Co., a corporation distinct from the manufacturing organization.

BRIGGS OUTPUT BRISK

DETROIT, Aug. 23—Business at the Briggs Mfg. Co., manufacturer of enclosed bodies, is running fully up to the height of business a year ago and practically at capacity. The office force at the factory has been doubled and almost as many men are at work in the factory as there were in 1920.

Good Crops Swell Southwest Sales

Many Dealers Report Business
Back to Normal—Trucks
Doing Better

DALLAS, TEX., Aug. 22—The automotive business in North Texas, Oklahoma, parts of Louisiana, New Mexico and Arizona, supplied by Dallas dealers and jobbers continued to show some improvement during the first half of August. Many of the retailers in Dallas and other parts of the trade territory reported their business back to normal.

The selling of cars has been augmented by the presence of some \$100,000,000 from the grain and fruit crops. This money is now in general circulation and the buying has been rather brisk. Retailers have noticed also that buyers are paying cash, or considerably more cash for cars than they have been for many months.

Accessory men from all sections of the territory report brisk business and tire dealers claim their business was never better. One thing making the accessory and tire business so much better than it has been for months is the thousands of cars from other states which are now touring Texas.

Trailer and truck dealers have also found business increased and prospects generally brighter, especially in the grain and cattle belts.

The gathering and marketing of the cotton crop will begin before the first of September. For months the automotive business has been dull in the cotton belts of Texas because the farmers were without money. Retailers, accessory and tire men are ready to invade these cotton belts as soon as the crop begins to move.

South American Trade, Better, Say Ford Agents

NEW YORK, Aug. 22—Distinct improvement in trade in some sections of South America is reported by Charles T. Lathers and George R. Brubaker, representatives of the Ford Motor Car Co., who have returned to this country on the Munson liner *Aeolus* from Buenos Aires after a study of business conditions. Their main purpose in making the trip was to effect changes in the management of the Buenos Aires branch of the company.

The Ford policy of cash against documents is working out very favorably, Lathers and Brubaker report. The branch has no bad debts, although there are about 300 machines in Pernambuco which have not been accepted.

Brazil is developing its highway systems, and the extension of improved roads is expected to have a substantial influence on the possibilities for American cars in that republic. Licenses, however, are too expensive.

Automotive Bureau Planned for Mexico

Expect Stabilization to Follow Move of American Commerce Chamber

MEXICO CITY, Aug. 10 (Special correspondence)—The American Chamber of Commerce has undertaken the organization of an automotive division and it is expected that the division will take up important work in an energetic effort to stabilize the business situation and to promote still further the demand for automobiles and automotive equipment in Mexico.

Improvement of existing roads, and the construction of new roads are going on rapidly. It is certain that the present activity toward good roads will result in continued efforts of the National Government, together with various State Governments, to improve materially the roads throughout the country.

Ford has opened a number of new agencies throughout this country. The third Ford agency in Mexico City has, in fact, just been given to A. F. Robertson, former manager of the Mayfield Auto Co. here. The new company is named the Robertson Motor Co. A. J. Sewall, a former Ford dealer under the Dallas, Tex., branch, has taken over the dealership at Guadalajara. The Dodson Manufacturing Co. is the new dealer at Torreon and Suess y Garcia Narro has opened a Ford agency at Zacatecas.

Effective Aug. 1, duty was placed on vehicles amounting to 75c. per kilo up to 250 kilos in weight, 60c. for the next 500 kilos and 50c. per kilo for weight in excess of 750 kilos. This does not apply to automobiles but it is rumored that the automobile industry may be affected by reinstatement of the old tariff on motor cars and it is possible that this may be put into effect as the present government needs additional revenue.

Gilland Lock Builds Factory in Michigan

DETROIT, Aug. 23—Gilland Auto Lock Co. is building a factory at Fenton, Mich., which is expected soon to be in production of a patented lock for automobiles which operates by a system of buttons attached to the dash. The buttons provide for hundreds of combinations. The ignition system is automatically cut off when the engine stops and can be started only on pressure of the buttons forming the combination. Pressure of the wrong buttons sounds an alarm either by horn or gong.

BOLLSTROM HAS RECEIVER

DETROIT, Aug. 22—S. O. Burgdorf has been appointed permanent receiver of Bollstrom Motors, Inc., St. Louis, Mich. The company's affairs will now be closed up.

5800 BUICK CARS SHIPPED DURING FIRST HALF OF AUGUST

DETROIT, Aug. 22—Shipments of Buick cars for the first half of August reached 5800, or approximately one-half of the 11,750 production schedule set for the month. With the fulfilling of this schedule the company will come within 250 cars of the biggest month it ever enjoyed. Present indications are that production will exceed this figure and probably set a new record. The shipments include all models, a large part being the new four-cylinder car.

Malleable Iron to Open Plant in Indianapolis

INDIANAPOLIS, Aug. 23—The Malleable Iron Co., a new organization in a new plant in Kokomo, opens next week to supply the Haynes Automobile Co. and the Service Motor Co. of Wabash. The opening of this plant provides employment for 500 men. The Haynes company will average full normal production this month, although at times it has exceeded normal production. The Kokomo Rubber Works has been busy and other automotive plants in northern Indiana are getting back to nearly capacity operations.

In the southern part of the State motor car and motor vehicle body manufacturers report very satisfactory increases in business.

The Lafayette Motor Co. is making five cars a day. Stutz has resumed on a small scale and the Nurdyke & Marmion Co. is operating to near capacity.

General conditions in the State have become encouraging, the building trades showing much activity. Crops have been fairly good but nothing unusual.

Raleigh to Produce New Passenger Car

NEW YORK, Aug. 22—A new passenger car to be known as the Raleigh Standardized Six, which has been undergoing development for over two years, is shortly to be produced by the Raleigh Motors Corp. in Buffalo, N. Y.

The car is an assembled product using a six-cylinder $3\frac{1}{4} \times 5$ in. Herschell-Spillman engine, Borg & Beck clutch, Grant-Lees transmission with Kellogg tire pump, Merchant & Evans universals, Columbia axles, Sharon frame, Gemmer steering gear and American Body Co. aluminum body. Westinghouse starting and lighting equipment and Bosch magneto ignition are employed. Fuel is fed to the Stromberg LB-2 carburetor by Stewart vacuum system of the 2 qt. "industrial" type system from 17 gal. tank at rear of frame. The wheelbase is 122 in. Hotchkiss drive through $54\frac{1}{2} \times 2\frac{1}{4}$ in. semi-elliptic underslung springs is employed. Wheels are Harvey disk type.

Export Situation Improved in July

Figures Undoubtedly Increasing —Decline Shown Comparing With Same Period 1920

WASHINGTON, Aug. 22—A bright spot appeared in the automotive export situation during July. There has been a slight increase in the volume of passenger cars and motorcycles exported to this country. These figures are undoubtedly increasing at this time despite the fact that there has been marked declines in foreign sales of other automotive products. The records of the Bureau of Foreign and Domestic Commerce, for July, show that 2224 passenger cars were exported, representing an increase of 260 over the previous month. Shipments of motorcycles amounted to 441, or 103 more than in June. In every other item the decreases during the month were noticeable. The value of automotive parts, not including engines and tires, fell off \$259,003 since June, while shipments of trucks were 109 less than the previous month, and the total number of engines declined by 845, as compared with June.

Compared with July, 1920, the figures for the same month of this year show a tremendous decline in the volume of automotive exports, for instance, during July of 1920, 2042 trucks, valued at \$3,434,070 were exported, as against 399 commercial cars with a value of \$314,237, for the corresponding month of this year.

Passenger car exports for June, 1920, amounted to 13,320, valued at \$16,220,965, and for the same period this year, 2224 cars valued at \$1,873,368, or a decline of approximately \$14,500,000.

There is a slump amounting to \$75,816,548 in the total value of passenger car exports for the seven months ending July, as compared with last year. The decline in the volume of engine exports was very marked. These figures indicate that the foreign trade department of the Government and the industry have a difficult problem on their hands to develop foreign markets.

Goodyear Officials on Inspection Tour

AKRON, Aug. 22—Officials of the Goodyear Tire & Rubber Co. have started on a month's inspection tour of the company's subsidiary corporations. In the party are E. G. Wilmer, successor to F. A. Seiberling as president of Goodyear; Vice-President and Factory Manager Paul Litchfield and General Sales Manager L. C. Rockhill.

The three have gone first to the Goodyear plants at Bowmanville and Toronto in Canada. From there they will proceed to California to inspect the Los Angeles tire plant and will then visit the Goodyear 56,000-acre cotton plantation near Phoenix, Ariz.

Registrations for Bay State Increase

**Figures for Three Months Exceed
1920 Period by Over 5000—
Trucks Gaining**

BOSTON, Aug. 22—An analysis of the registration figures by the motor vehicle department for the year up to Aug. 1 shows a tendency toward buying for the last three months.

For May, June and July there were registered 55,081 cars. For the same period last year there were 50,842 registrations. And last year was regarded as an exceptional year until the slump came along in the fall.

For the entire period up to Aug. 1 there were registered a total of 266,342 cars while for the same period a year ago there were 220,799 giving an increase this year of 45,543. Of course a large number of these 1921 registrations were used cars.

Figures for Months

In 1920 there were 33,417 registrations in April. May they dropped to 21,771. June they figured 15,128 and July 13,943. This year there were 37,447 in April. The drop in May was to 20,687, or 6760 against the last year drop of 11,646, a balance of 4886 in favor of 1921.

June of last year showed a decrease from May of 6643. In 1921 for the same months the decrease was but 1857, or another balance for this year, this time of nearly the same as the preceding month, or 4786. This July showed a larger falling off than a year ago, for the decrease in 1920 was 1185 while for 1921 it was 3266.

What is happening, apparently, is that buying is going along like a series of waves, up and down. About every dealer has a number of very live prospects, some with cars, others figuring on buying. These people are trying to solve the fall business, and while they hope it will pick up they are not certain therefore they intend to continue along until they see how things are going to shape up.

Trucks Show Gain

This is reflected, too, in the registration of trucks. While the total for the year is larger by 5063 than a year ago, the monthly registration figures show that for the past four months the totals are smaller than for the same ones in 1920. But the declines average pretty nearly the same as for the last four months of 1920.

The fees show a large increase, however, and the State is \$773,827 richer this year than for the same seven months of 1920. This year the fees have climbed to \$4,115,688.50. With this average for a comparison when the fines are computed later Massachusetts will get from the motorists this year about \$5,000,000.

ORIGINAL VANNIMAN ENGINE RESTS AT BOTTOM OF LAKE HURON

AKRON, Aug. 21—The original Vanniman engine, used to propel the huge Vanniman dirigible, the first large dirigible to be built in America, and which crashed near Atlantic City nine years ago, killing its pilot and crew, now rests somewhere on the bottom of Lake Huron.

The Vanniman airship was built by Goodyear. After the disaster at Atlantic City the huge engine was dug from the sands where it imbedded itself in its fall from the skies and was shipped to the Les Cheneaux Islands in Lake Huron, to the summer home of F. A. Seiberling, founder and former president of Goodyear. A high-powered motor boat was constructed for Penfield Seiberling, aged 22, son of F. A. Seiberling, the Vanniman engine being installed in it.

A few days ago, while speeding near the Les Cheneaux Islands, young Seiberling's boat struck a rock. Due to the heavy weight of the engine, the craft sank in less than a minute. Young Seiberling, after swimming around for nearly half an hour, was rescued by Stewart Rodgers of Cleveland.

Pierce-Arrow to Have New Enclosed Models

BUFFALO, N. Y., Aug. 22—The Pierce-Arrow Motor Car Co. has introduced four new enclosed drive bodies for the Standard Pierce-Arrow Dual Valve Chassis. These are in addition to the standard open and closed types of cars already listed. The new ones include a coupé; four-passenger, four-door sedan; seven-passenger sedan, and a seven-passenger vestibule sedan.

Several new constructional features are used in these models, among which are a new form of roof construction which does not differ any in appearance from the previous roof construction, but eliminates drumming. The roof, instead of being a sound board to intensify noises, deadens all sounds. Special attention has been given to ventilation and the duplex windows in the rear quarters lower close to the sill, the door windows open fully, and the windshield is adjustable. A cowl ventilator forces air along the floor boards, while a new roof ventilator, cleverly concealed by the dome light, draws air from the interior.

PASS AUSTRALIAN TARIFF

LONDON, Aug. 16 (By Mail)—The revised Australian tariff has been passed in the face of strong opposition by the agricultural interests and the rest of the Empire against a reduction from 12 per cent to 5 per cent in the preferential rate accorded British goods.

Cleveland Tractor Puts Out New Model

**Lightweight Cletrac Is Radically
Different—Will Sell for \$845
Complete**

CLEVELAND, Aug. 20—A new, lightweight Cletrac has been added to the line of the Cleveland Tractor Co. The new tractor, which is known as model F, is also a tank type, but of radically different construction throughout as compared with the larger Cletrac.

Weighing but 1820 lb., and with an overall width of but 32 in., this new tractor lends itself readily to such work as corn cultivation, being able to operate between corn rows without difficulty. In order to facilitate this function, a cultivator which is particularly adapted to the machine has also been brought out by the Cleveland Tractor Co. The new tractor sells for \$845 complete f.o.b. Cleveland, and the cultivator \$135. This is a two-row cultivator and with the new lightweight tractor puts in the hands of the dealer a complete unit which is priced at less than \$1,000 f.o.b. the factory.

The new tractor is constructed of chrome steel wherever severe stresses are encountered. It is noteworthy for the exceptionally ingenious use that is made of pressed steel in its construction. The track chain operates upon a floating roller chain in place of wheels and differs in this respect materially from the other Cletracs. The makers claim a plowing rate of 6 to 8 acres a day using two 12-in. plows. It is stated to develop 16 hp. at the belt and 9 hp. at the drawbar. The overall dimensions are 80 in. in length, 50 in. in height and 32 in. in width. The four-cylinder engine has a bore of 3¼ in. and a stroke of 4½ in. It is rated at 16 hp. with kerosene at the normal speed of 1330 r.p.m. There is one speed forward and one reverse. A feature of the design is that the entire tractor is self lubricating from the supply of oil in the motor and gearcase unit, which is all contained in one housing. The tracks are designed to run without lubrication so that a minimum amount of upkeep attention is required.

BELGIAN TRADE GOOD

LONDON, Aug. 12—(By Mail)—The automotive industry in Belgium has had a rapid recovery. The possibilities of export trade have been taken up seriously and have led to the design of light but strong cars of from 12 to 14 horsepower for export. The centers of business are Liège and Brussels. Belgian roads are notoriously bad and for this reason the cars designed for export are equally well adapted for use at home.

Other Belgian exports which are increasing in volume are one- and two-ton trucks and motorcycles. An especially good market for motorcycles is found in the Balkans and Greece, the Belgian Congo and in Brazil.

Townsend Highway Bill Passes Senate

Measure Providing \$75,000,000 Goes Over With Commission Proviso Eliminated

WASHINGTON, Aug. 23—Eliminating the provision calling for the establishment of a Federal Highway Commission, the Senate to-day passed the Townsend highway bill appropriating \$75,000,000 for the construction and maintenance of roads, one-third of which will be available immediately and the balance to be distributed within six months. It was for the recognition of this highway commission plan that the automotive industry conducted a strong legislative campaign. The defeat was brought about by an unexpected eleventh-hour change of front on the part of Senate leaders. It is believed that the opposition developed not because of the industry's advocacy of it, but owing to the growing evidence of a reaction against bureaucracy or investment of power in new commissions.

Fight for Economies

Senators from the eastern states, where the highway system is fairly well developed, were quick to oppose the appropriation of \$100,000,000, as proposed by the Senate Committee on Post Office and Post Roads. Senator Lodge of Massachusetts, Republican leader in the Senate, insisted that it was only fair to the taxpayers of the country that economies should be made in road expenditures as well as in other forms of governmental enterprise. He declared that it would be at variance with the administration's program of economy if such large appropriations were sanctioned. An effort was made to cut the appropriation in half, but subsequently it was agreed to appropriate \$75,000,000.

The movement to abolish the highway commission, as proposed in the Townsend bill, was a distinct surprise to Senator Townsend and southern Senators who had heretofore opposed any change in the distribution of Federal funds, but later agreed to a compromise bill. Representative leaders declared that their action was based upon the fact that a report will be received shortly from the reorganization committee now planning the redistribution and reorganization of Government departments. It is believed that the control of highways, which is now vested in the Bureau of Public Roads, Department of Agriculture, will be transferred to a separate highway bureau in the proposed department of public roads, or to the Department of Commerce, because of the gradual recognition of the fact that highway transport and transportation affects business more than agricultural interests. For a time it appeared that the so-called agricultural "bloc" in the Senate had taken control of the highway bill, but developments showed that it was the drive of

NORTHWESTERN BANK SEES BEGINNING OF END IN DEPRESSION

MINNEAPOLIS, Aug. 23—Economists have agreed that inasmuch as the Northwest was the first section of the country to begin liquidation, its recovery will mean the beginning of the end of depression in the United States. Conditions in this section undoubtedly are improving. In this connection the Northwestern National Bank, the largest in the Northwest, says in its monthly review of conditions:

"There has been a large carry over of obligations, and many of our trade difficulties caused by uneven readjustment processes have not been overcome; but in spite of disadvantages to surmount, the Northwest is definitely on the way to a recovery of its deferred prosperity. Bankers comment quite generally that the turn in affairs has come, although it will be far from a stampede toward affluence. Most of them believe that the present prices of grain and live stock, coupled with high freight costs, will make impossible a rapid or complete liquidation this season. Freight rates are the main factor out of the general alignment, to judge from the general comment."

the administrative leaders for economic limitation of commissions that changed the committee's bill.

The bill as reported from the committee would probably have passed with the commission plan intact if a delay had not been occasioned by the inquiry of Senator Pomerene as to the terms of the measure and his objection to a vote until delays could be given him. The Senate leader decided to rule adversely on the commission plan during the interim.

As a result of the debate on Tuesday it was decided that 60 per cent of all Federal funds should be expended on three-sevenths of the total mileage of any State and the remaining 40 per cent to be expended on the next 4 per cent of State roads, thus assuring interstate roads. This agreement is regarded as a forward step by the industry agents. The bill, when passed by the Senate, will go to conference, but will not become a law for several weeks as a result of the congressional recess.

OHIO LENS MAKERS BUSY

COLUMBUS, OHIO, Aug. 23—Lens manufacturers and agents are rushed to death in Ohio supplying the demand for anti-glare lenses. The State law defining the lenses to be used became effective Aug. 15 and the lens people have been reaping a harvest. The Ohio Highway Department has approved about three score of different lenses.

The rush of business is expected to last for a week at least.

Packard Plans Big Advertising Drive

\$200,000 Publicity Campaign Begun in Newspapers for Fall Business

DETROIT, Aug. 22—Packard Motor Car Co. has launched a \$200,000 advertising drive for fall business through the medium of local newspapers in all sections of the country. The drive will continue for five weeks and will be staged throughout in close co-operation with the distributor organization in each territory.

The potential fall market for cars is so large, officials said, that the company feels fully warranted in investing \$200,000 in developing it. There is no question, officials said, but that sales of cars from Sept. 1 can be brought up to a high level by a well-planned and well-executed campaign.

The introduction of the single-six line has brought a great increase in the number of Packard dealers, and this number is being constantly augmented. Cities and towns which formerly were too small for twin-six representation have now regular Packard dealers who are turning in steady streams of new business.

Orders at the factory are showing gains. On Aug. 19 production on twin-sixes was one month behind orders. Truck sales in the first ten days of August ran 59 per cent ahead of orders for the same period in July. The increase in twin-six business for August over July was considered remarkable at the factory in view of the heavy price reduction made in July.

Reports from territorial distributors show good business. Twin-six sales in Chicago for July equalled previous three months' business. Detroit retail sales in July ran in excess of \$250,000. Reports from New York and Philadelphia showed dealers sold out of touring cars and waiting deliveries. Single-six sales at the factory in July equalled the two previous months.

COLT WILL FILED

PROVIDENCE, R. I., Aug. 20—Under the will of Colonel Samuel P. Colt, which has been filed for probate here, \$410,000 was left in public bequests. Other specific bequests to individuals aggregated \$1,069,000, not including \$1,000 left to each employee of the Industrial Trust Co. Senator L. B. D. Colt, the Colonel's brother, and Russell G. Colt and Roswell E. Colt, his two sons, get \$100,000 each.

A. E. A. SEEKS SLOGAN

CHICAGO, Aug. 19—The Automotive Equipment Association, through its new merchandising director, Ray A. Sherman, has made an appeal to the industry for a slogan fitting the greater sales campaign now being waged by the association. All ideas for such a sales phrase are to be sent directly to Sherman, City Hall Square Building, Chicago.

Gas Quality Rises as Prices Come Down

Survey Shows 25% Cut Was Accompanied by Increased Volatility

WASHINGTON, Aug. 22—Fears of automobile users that cheap gasoline would mean inferior grades have proven unfounded, as the fourth semi-annual motor gasoline survey conducted during July by the Bureau of Mines shows that a price cut of about 25 per cent was accompanied by an increased rather than lessened volatility of the product. The studies conducted in the larger cities of the country at all seasons indicated that the volatility of the gasoline was improved in the winter months, thus assuring better performance with the motor, especially at starting.

The bureau is convinced that the quality of gasoline to-day is much better than it was last summer, despite the price reduction. It is interesting to note that the average reduction in gasoline prices has been seven cents per gallon at tank wagon quotations.

At the end of May, 1921, there was over 800,000,000 gallons of gasoline in storage at the refineries, a figure never before reached in the history of the industry.

The increases noted in production and in stocks are sufficient to explain the drop in price and the improvement in volatility. It is interesting to note, however, that there is no uniformity in the relation throughout the country. Some cities show improvement in quality and little change in price, while in others the gasoline is similar to that sold a year ago, but the price has dropped markedly.

Exports of gasoline for the first five months of 1921 are larger than for the same period of 1920. For this period, shipments to our insular possessions and domestic consumption are also larger than they were a year ago, so the total outgo of gasoline for the first five months of 1921 is almost 200,000,000 gallons greater than it was for the corresponding period in 1920.

It is only in a study of production figures that the explanation is found. Production of gasoline for the first five months of 1921 was almost 400,000,000 gallons greater than for the same period in 1920. Imports were less, but the increase in the total income of gasoline is much greater than the increase in total outgo.

NEW LEACH-BILTWELL "SIX"

LOS ANGELES, CAL., Aug. 23—The Leach-Biltwell Motor Car Co. has just brought out a new model of the Power-Plus Six, the first cars being displayed at the First Industrial Trade Exposition. While some of the mechanical details remain as before, the engine is entirely new, being made in the company's own plant. It has overhead valves and is said to develop over 100 hp. on the brake.

The cylinder dimensions are 3 3/4 x 5 1/4 in. The wheelbase has been lengthened to 134 in. Prices on all models have been set at \$6,500. Standard units include Delco ignition, Timken axles, Disteel wheels and Prest-O-Lite battery. The gearset is made by the company.

New Orleans Ruling Would Affect Trucks

NEW ORLEANS, LA., Aug. 22—All motor vehicles with a combined weight of truck and load of more than two tons and all horse-drawn vehicles weighing, with load, more than 2300 pounds would be barred from certain residential streets of the city of New Orleans under the terms of a municipal ordinance just introduced in the city council by Commissioner of Public Safety Ray.

The ordinance also fixes size limits of motor trucks, specifying that no truck shall exceed 30 feet in length and, with trailer, two being allowed, shall not exceed 70 feet in length. Exceptions in the ordinance grant the barred vehicles the privilege of making immediate delivery within the limits specified or of taking on loads therein.

According to weight and tires the speed limit of motor trucks is fixed at from 15 to 20 miles per hour in the daytime and not more than ten miles per hour after nightfall. The ordinance also designates certain paved streets as heavy traffic avenues through which the vehicles forbidden to the residential section would be expected to pass.

Canada Shows Gains in Exports to Australia

OTTAWA, ONT., Aug. 22—The increase in Canada's trade with Australia for rubber tires, tubes and solid tires during 1919-20 over the 1918-19 figures was quite remarkable, the increase being £122,845, the total business for the 1919-20 period being £304,430.

American imports fell off from £434,626 to £431,262, a slight loss of £3,364.

Total importations from all sources in 1918-19 were valued at £811,034 and for the next year £884,590, an increase of £73,556.

NEW CAMERON TRACTORS

NEW YORK, Aug. 23—The Cameron Motors Corp., which recently took over the plant of the Dauch Mfg. Co. at Sandusky, Ohio, announces that it will bring out a new small, general purpose tractor under the trade name of Sandusky Model A. It will be equipped with a four-cylinder Cameron air-cooled motor and will be simple both in construction and design. The price will be \$425. The company asserts that its fuel consumption will be comparatively small. The Dauch Mfg. Co. has 300 dealers and Cameron Motors proposes to increase this organization by the addition of 700 more workers within the next week or so and as business necessitates.

Sherman Gives Out A. E. A. Selling Plan

Chicago Manufacturers Ready to Support Idea—Vigorous Campaign to Start

CHICAGO, Aug. 20—Details of the merchandising plan of the Automotive Equipment Association, which was authorized at the Mackinac Island convention, were made public for the first time last evening at a meeting of the Association of Automotive Equipment Manufacturers by Ray W. Sherman, who recently left the Class Journal Co. to become the merchandising director of the A. E. A. The organization which heard the story last evening is made up of equipment manufacturers in the Chicago district, most of whom belong to the A. E. A. The manufacturers expressed their approval of the plan and gave assurances of their support for the work.

As a first step in the plan the association plans to enlist the assistance of the jobbing salesmen, many of whom have already won the approval of dealers by efforts to show how business profits may be increased without much increase in operating cost by installing automotive equipment departments. That the merchandising plan may be presented to the largest number of dealers in the shortest time a book on the subject is being prepared and will be ready for distribution this fall. The entire industry will lend its assistance to the distribution. Briefly described, the book will tell how to add to business profits by equipment sales and will tell how to sell.

Many meetings of jobbing organizations and also of dealers are planned.

The automotive equipment week, Aug. 6-13, proved successful and other national campaigns for the furtherance of business are planned.

Limousine Top Making Practical Sedan Body

KALAMAZOO, MICH., Aug. 22—A practical type of sedan body for use in the equipment of the higher grade of automobiles has been worked out and designed by the engineering department of the Limousine Top Co. It will soon be regular production at this plant.

These bodies are built of leather inside and out, the body material corresponding exactly with the material used for seats and cushions, that is, in color effect. The side sections are set in heavy metal frames, bound in leather and are of the best grade of heavy French plate glass. They are easily adjustable and can be removed or put in place at will. When not in use these glazed leather side sections are carried in a well appointed case that folds under the front seat, thus being entirely out of the way.

The first body shown here was finished in a rich maroon leather, with maroon Spanish leather seats.

Akron Production Waste \$20,000,000

Survey Shows Vast Losses in Rubber for 1919 and 1920—
Could Save 15%

AKRON, Aug. 23—Millions of dollars are lost every year in the rubber industry in Akron through production waste, according to the statements of salvage experts, who estimate that the total production waste in 1919 and 1920 in Akron's rubber and tire factories amounted to nearly \$20,000,000.

Practically all tire companies here are training men scientifically to aid in salvaging waste materials, and also are conducting educational campaigns among factory operatives and tire builders, in an effort to increase efficiency and to eliminate avoidable production wastage. Salvage experts claim fully 15 per cent of the total waste in Akron's rubber plants each year can be eliminated as a result of such educational work, through the proper training of salvage men and through proper waste utilization.

The Goodyear Tire & Rubber Co. alone estimates that its production waste in 1919 and 1920 was \$6,880,878 as compared to a total production cost of \$156,023,307. This means a wastage percentage of production cost of 4.409 per cent.

Can Save 15 Per Cent

At least 15 per cent of this can be saved if workmen, inspectors and foremen are alert, painstaking in their work and efficient, according to C. E. Falor, Goodyear salvage expert and manager of the company's by-products department which handles all matters pertaining to production wastage.

Much of the waste is salvaged, some of the salvaged material being re-absorbed in various departments and the remainder being sold. The sale of salvaged material by Goodyear last year amounted to \$1,181,954, while it is estimated that \$3,770,279 worth of salvaged wastage was absorbed in the manufacture of by-products. Friction wastage alone in 1919 and 1920, according to Falor, amounted to \$3,630,461. In addition to heavy rubber and fabric salvage, the company last year salvaged 5100 tons of scrap iron. By use of a large magnet for loading the scrap iron, a saving of over \$2,000 over the cost of man power for loading accrued, Falor states.

Scrap Great Crop

"Next to wheat, scrap is one of America's greatest crops, and it takes men with scientific training to harvest it," states Falor. "We are using in our salvage work only men who have passed the foresight and mental alertness tests. Many of them are college graduates. There is a fast future for proper salvage work. It is a science in itself.

"The salvage department of any big corporation must be a service department, intended to assist rather than en-

force, and to help rather than to criticize in the work of reducing production wastage and increasing wastage salvage," states Falor. "It must back up its records with accurate statistics brought down to each individual if possible, to show each man's efficiency and to determine the extent of individual production wastage."

New York Studebaker Predicts "Best Month"

NEW YORK, Aug. 22—The New York branch of the Studebaker Corp. reports that this month probably will be the best August in its history, although comparison with previous months indicates that the company is feeling some of the effects of seasonal let-up in automobile buying.

The best month the New York branch ever enjoyed was last June, when 451 vehicles were sold. July deliveries were 328 cars and indications are that August sales will run about 90 per cent of July, or something like 300 machines.

There is an unusually heavy demand for Studebaker closed cars in the Metropolitan district and some business is being lost every day because of inability to make immediate deliveries. The factory is expected to increase the proportion of closed cars to open models turned out from now on, and while sales of the latter may show some further falling off this fall and winter, sales of coupés, sedans and limousines are expected to be heavy.

Ford Dealers in Mexico Agree Future Is Bright

HOUSTON, TEXAS, Aug. 22—More than 100 Ford dealers and agents in Old Mexico have been in Houston this week to discuss the situation in the southern republic with the officials of the branch Ford house here. From the reports gathered from these agents, the greater part of whom are Mexicans, the prospects for the automobile business in the Land of the Montezumas are exceedingly bright. They declared things are rapidly getting back to normal in Mexico and that since revolts and banditry have stopped and the people are following the peaceful pursuits of agriculture and stockraising, money is more plentiful and hence more cars are being bought.

The Mexican dealers declare what is greatly needed in Mexico now in addition to regular automobile houses is some big accessory house and that until such house is established at some central point the Mexican dealers will be compelled to be satisfied with meager supplies on hand and depend upon the Texas dealers for the main business.

The Mexican agents were greatly interested in tractors and trailers and were placing orders for what they could carry. They declared the Mexican ranchers and plantation owners are waking up to the value of these things and are in the market for them. They agreed conditions are brighter.

Former Revere Head Seized on Charges

Stockholder Files Grand Larceny
Complaint Against Newton
Van Zandt

INDIANAPOLIS, IND., Aug. 20—A charge of grand larceny has been filed in city court at Logansport, Ind., against Newton Van Zandt, formerly president of the Revere Motor Car Corp. of Logansport.

The action was taken by John B. Porter of Buffalo, N. Y., a stockholder in the company. Porter also filed civil suit in the Cass circuit court against Van Zandt and the Revere Motor Corp. and its receiver, the Citizen's Loan & Trust Co. asking \$10,000 judgment. It is alleged in the complaint that the plaintiff, who is president of Blackburn, Inc., Buffalo, N. Y., bought \$4,050 of stock of the Revere Motor Corp., the purchase price being made through Van Zandt, president of the company at that time.

The complaint asserts that Van Zandt represented to the plaintiff that the Revere Motor Corp. had its output contracted for five years in advance, at a profit of \$500 a car, the contract being with a New York firm. The plaintiff asserts that he later learned there was no such contract. Word received here this morning is to the effect that Van Zandt has been arrested in Philadelphia, but dispatches did not say whether he would fight extradition to Indiana.

Acceptance of Ford's Nitrate Offer Urged

WASHINGTON, Aug. 22—Approval of Henry Ford's offer for the purchase of the Muscle Shoals, Ala., nitrate plant and lease of the dams is urged by James E. Smith of St. Louis, vice-president of the Mississippi Valley Waterway Association, and other officers of that organization. They say that if the plants were completed and their operation assured, more than 150 miles of land rich in iron, coal and other valuable deposits would be open to development along the upper Tennessee River.

WHEEL PLANTS BUSY

DETROIT, Aug. 22—Prudden Auto Wheel, Gier Pressed Steel and Motor Wheel plants of the Motor Wheel Corp. are now operating on a full six day week. Motor Wheel plant has increased the number of men on its payrolls from 600 to 1075; Prudden is now employing 750, and Gier, from almost complete suspension 60 days ago, is now employing 175. Die and toolmaking divisions at the Gier plant have been working overtime preparing to go into production on new contracts signed during the dull season. The general atmosphere around the plant indicates brisk business. Every day finds a greater volume gotten out at the three plants.

Texas Relieved as Truck Bill Passes

Objectionable Features Are Eliminated from Measure Regulating Commercial Vehicles

AUSTIN, TEXAS, Aug. 23—Motor truck dealers and operators of these vehicles are much relieved by the passage of a bill by the Legislature repealing the more objectionable features of the "motor truck law" which was enacted at the last regular session of the law-making body. As the measure finally passed both branches it increases the annual license fee on commercial motor vehicles according to net carrying capacity and tire equipment, but the mileage tax imposed by the regular session of this Legislature is eliminated. Trucks and tractors used exclusively for agricultural purposes are exempted from the special license fees stipulated in the bill, but it is provided that license fees shall be paid on agricultural trucks according to horse power just as now paid by automobiles. Fees for tractors not used for agricultural purposes are based on weight.

Under an amendment adopted by the conference committee a license shall not be issued to any truck of more than four tons carrying capacity, except on written application to the Highway Commission showing that roads would not be injured by such trucks. The bill provides, however, that no license shall be issued to trucks of more than 5-ton carrying capacity.

Some of the Rules

Another section of the bill provides that county road superintendents or supervisors may during wet weather prohibit the use of any highway to loads of such weight as would damage the roads.

Speed limits are fixed according to gross weight of vehicle and load and according to tire equipment. Pneumatic tire equipment is favored in this as well as in the case of license fees, higher speed limits being allowed vehicles equipped with pneumatic tires as lower license fees have been provided for such vehicles.

All trucks must be equipped with rear-view mirrors and no truck shall operate with solid tires less than 1 inch in thickness at any point or with pneumatic tires where one of such tires is missing. Drivers operating cars in this condition are subject to penalty of not more than \$200 as are also those drivers who operate vehicles of more than 4-ton carrying capacity without special permit.

Following is the scale of license fees provided for commercial motor vehicles, which are defined as any motor vehicles designed for the transportation of property:

Carrying capacity—1 to 2000 lbs., pneumatic tires, \$15; solid tires, \$18; 2001 to 3000 lbs., pneumatic tires, \$20; solid tires, \$26; 3001 to 4000 lbs., pneumatic tires, \$24; solid tires, \$34; 4001 to 5000 lbs., pneumatic tires, \$30; solid tires, \$40; 5001 to 6000 lbs., pneumatic tires, \$36; solid tires, \$48; 6001 to 7000 lbs., pneumatic tires, \$42; solid tires, \$54; 7001 to 8000 lbs., pneumatic tires, \$48; solid tires, \$60; 8001 to 9000 lbs., pneumatic tires, \$54; solid tires, \$66; 9001 to 10,000 lbs., pneumatic tires, \$60; solid tires, \$72; 10,001 to 11,000 lbs., pneumatic tires, \$66; solid tires, \$78; 11,001 to 12,000 lbs., pneumatic tires, \$72; solid tires, \$84; 12,001 to 13,000 lbs., pneumatic tires, \$78; solid tires, \$90; 13,001 to 14,000 lbs., pneumatic tires, \$84; solid tires, \$96; 14,001 to 15,000 lbs., pneumatic tires, \$90; solid tires, \$102; 15,001 to 16,000 lbs., pneumatic tires, \$96; solid tires, \$108; 16,001 to 17,000 lbs., pneumatic tires, \$102; solid tires, \$114; 17,001 to 18,000 lbs., pneumatic tires, \$108; solid tires, \$120; 18,001 to 19,000 lbs., pneumatic tires, \$114; solid tires, \$126; 19,001 to 20,000 lbs., pneumatic tires, \$120; solid tires, \$132.

lbs., pneumatic tires, \$100; solid tires, \$120; 8001 to 9000 lbs., pneumatic tires, \$120; solid tires, \$144; 9001 to 10,000 lbs., pneumatic tires, \$150; solid tires, \$180.

For each trailer or semi-trailer drawn by a commercial vehicle or tractor, per 100 lbs. gross weight of vehicle and capacity load equipped with pneumatic tires, 15 cents; solid rubber tires, 25 cents; iron, steel or other hard tires, 35 cents.

Provided that semi-trailers equipped with iron, steel or other hard tires shall pay at the rate of \$1 per 100 lbs. of gross weight as specified under this section.

For tractors, the annual license fee shall be based upon the weight of the tractors as follows: 1 to 2000 lbs., \$5; 2000 to 4000 lbs., \$10; 4000 to 6000 lbs., \$15; 6000 to 8000 lbs., \$20; 8000 to 10,000 lbs., \$25.

Following is the speed limit scale. Commercial motor vehicles equipped with pneumatic tires, maximum weight in pounds, including gross weight of vehicle and load:

2001 to 4000, 22 m.p.h.; 4001 to 6000, 18 m.p.h.; 6001 to 8000, 15 m.p.h.; 8001 to 10,000, 12 m.p.h.; 10,000 to 12,000, 10 m.p.h.

Commercial motor vehicles equipped with solid rubber tires, maximum weights in pounds, including gross weight of vehicle and load:

1500 to 2000, 20 m.p.h.; 2001 to 6000, 15 m.p.h.; 6001 to 8000, 12 m.p.h.; 8001 to 10,000, 10 m.p.h.

Civilian Air Board Bill Is Introduced

WASHINGTON, Aug. 25—Senator Wadsworth of New York to-day introduced a bill in the Senate providing for establishment of commission of civilian aeronautics. The bill is said to represent plans of permanent aviation engineers and aircraft manufacturers, many of whom are identified with the automotive industry. The bill, which has been referred to the Senate Committee on Commerce, provides for a commissioner at a salary of \$7,500 and assistant commissioner at \$5,000 with a necessary clerical force. The bill as drafted would give the commission authority to investigate and design the construction of all aircraft and if approved to license all civil aircraft, to regulate navigation and operation of civil aircraft with established rules and regulations, to foster aeronautics by designating, mapping and approving of layout air course and to control all civil aeronautics.

ZR-2 Is Destroyed; Loss of Life Heavy

NEW YORK, Aug. 25—The dirigible ZR-2 which was built in England for the American Navy was completely destroyed in an accident during a trial trip near Hull, England, yesterday, and 43 of the 48 occupants perished, including 16 out of 17 Americans on board. The ZR-2 was the largest dirigible ever built, being 695 ft. long, 84 ft. 4 in. in diameter and having a gas capacity of 2,700,000 cu. ft. From the reports of eye witnesses and survivors of the disaster it appears that some of the girder work of the hull near the middle of its length gave way and the gigantic structure practically broke in two in the middle. This was followed by a number of terrific explosions, the last one occurring as part of the hull came down on the Humber River. The ZR-2 had been in the air a total of 35 hours up to the time the accident occurred, but it appears that this was the first time she was going under full power.

Detroit Sees First Trackless Trolley

Packard Demonstrates Working Model—Five Other Bids Received by Mayor

DETROIT, Aug. 23—Packard Motor Car Co. demonstrated here to-day its first trackless trolley bus, the vehicle being built in conjunction with Westinghouse Electric & Mfg. Co., as a working model for operation on the new municipally owned trolley lines in this city.

The bus was built to meet specifications designed by city officials, and if present plans are carried out 50 will be ordered for immediate operation in city streets. President Alvan Macauley of Packard said the company could deliver this number in six weeks if the order is given. The estimated cost is \$8,065 each.

Other bids were received, but Packard was the only company to furnish a working model. Other bidders were: J. G. Brill Co., Philadelphia, \$8,744; Standard Motor Co., Detroit, \$8,950; National Safety Car & Equipment Co., St. Louis, \$7,325; St. Louis Car Co., \$7,800; International Motor Truck Corp., Detroit, \$9,988.

Mayor Is Impressed

Mayor Couzens, much impressed with the possibilities of the vehicle for public transportation, said:

"I do not wish to appear definitely committed to this type of car, but from what I have seen I believe it can be used very successfully in conjunction with our municipal lines and, with time, developed to give adequate service in the downtown district."

The street railway commission of the city was represented by Commissioners William B. Mayo and G. O. Ellis, the former, chief engineer of the Ford Motor Co. Though each considered the bus practical for suburban districts, they said it would have to be considerably developed to meet requirements of transit on busy streets. Further action will be taken at a meeting this week.

The vehicle used to-day followed the usual bus outlines except for the double trolley pole on the roof. It was 24 ft. long, 8 ft. wide and weighed 11,500 lb. The model used to-day seats 29 persons, but the design which the Packard company plans will seat about 40.

Through the special trolley arrangement the bus was enabled to range from one curb-line to the opposite one. Its turning area was small, considering its size.

Control of the bus, both power and brakes, is worked by the feet of the operator. There is also an emergency hand-brake. Power is thrown on and off by a treadle. There are two speeds, 15 and 25 miles an hour, all regulated by foot pressure. Both hands of the operator are free to steer and to handle fares and the single door.

Graham Reimports Measure Is Held Up

90% Duty Feature Meets with the Objections of Senator Pomerene

WASHINGTON, Aug. 23—Objection of Senator Pomerene, Democrat, of Ohio, to the consideration of the joint resolution imposing a duty of 90 per cent on all reimported army supplies, including automobiles and trucks, temporarily delayed the passage of this measure in the Senate this week. It is believed, however, that it will pass after the Congressional recess.

Contained Amendment

The Graham resolution as reported by Senator Watson, of Indiana, from the Senate Committee on Finance, contained an amendment drafted by the committee. The amendment provided that the provisions of the resolution should not apply to "any goods, wares, merchandise or military or naval supplies purchased prior to Aug. 15, 1921, by any citizen of the United States, or by any partnership, corporation, or association created or organized in the United States, and exported to the United States prior to Nov. 1, 1921, if (1) such purchases are certified to by the United States consul, and (2) such citizen, partnership, corporation, or association files within 45 days after the approval of this resolution with the Secretary of the Treasury and the United States consul a certified copy of the instrument of purchase of such goods, wares, merchandise, or military or naval supplies. The term 'United States consul' means the United States consul in the country from which such goods, wares, merchandise, or military or naval supplies are exported to the United States who certified to the consular invoices."

Senator Watson Speaks

Senator Watson stated that the amendment was drafted by the committee in response to the plea of American second-hand goods dealers and certain groups of bankers who have financed them. He further stated that these citizens had purchased in the aggregate about \$6,000,000 worth of goods, some of it on the high seas in transit to this country; some at the ports awaiting shipment, and some on cars waiting to be transported to ports for shipment. The Committee on Finance believes, inasmuch as these goods were purchased by American citizens in good faith; inasmuch as banks had loaned them money with which to make the purchase, and inasmuch as credit has been established in France on the borrowings thus made, it would be unfair to exclude these goods from coming into the United States. Hence, they drew up an amendment allowing them to enter until Nov. 1.

American truck manufacturers and dealers were largely responsible for this

resolution because they suffered keenly from the effects of unfair competition. The fact that the Senate Finance Committee consented to delay the imposition of the duty was not at all to their liking, because they believed that legitimate business enterprise should have protection rather than organized speculators in war supplies. It is claimed that speculators are free from many of the burdensome taxes imposed on legitimate dealers and manufacturers. There is a possibility that the Senate may strike out the committee amendment and pass the Graham resolution in its original form in order to prevent delay in the enactment of this important legislation.

Post-Whitney Plans Fall Tractor Sale

CLEVELAND, Aug. 19—The Post-Whitney Co., a consolidation of the Post Tractor Co. of Cleveland, the Whitney Tractor Co. of Upper Sandusky and the Chief Motor Co. of Port Huron, has made plans for the sale and distribution of a large number of tractors in the next 16 months.

S.A.E. to Have Winter Meeting Jan. 10 to 13

Many Subjects to Be Discussed at Annual Conference of Engineers

NEW YORK, Aug. 23—The Meetings Committee of the Society of Automotive Engineers has announced that the Annual Meeting of the Society will be held at the United Engineering Societies Building, New York, Jan. 10 to 13, inclusive, Tuesday, Wednesday, Thursday and Friday, of New York Automobile Show Week.

The meeting will open as usual with a session of the Standards Committee, the only event scheduled for Tuesday. Business and professional sessions will be held on Wednesday, probably morning and afternoon. The annual carnival is planned for a late hour Wednesday evening. Professional sessions will be held on Thursday, and probably on Friday. The annual dinner is scheduled for Thursday evening, as usual.

Statement Showing General Motors Sales for Passenger Cars, Trucks and Tractors

NEW YORK, Aug. 25—Passenger and commercial car sales by Divisions of General Motors Corporation, as reported to the National Automobile Chamber of Commerce, follow:

1921	First Quarter	Second Quarter	Six Months	
Passenger Cars:				
Buick	9,945	19,020	28,965	
Cadillac	1,394	3,484	4,878	
Chevrolet	5,007	20,153	25,160	
Oakland	2,775	3,598	6,373	
Oldsmobile	4,976	6,385	11,361	
Scripps-Booth	532	929	1,461	
Commercial Cars:				
Chevrolet trucks.....	466	863	1,329	
GMC trucks.....	491	801	1,292	
Oldsmobile trucks.....	15	...	15	
Totals:				
Passenger cars.....	24,629	53,569	78,198	
Commercial cars.....	972	1,664	2,636	
Miscellaneous*	3,660	7,389	11,049	
Grand total.....	29,261	62,622	91,883	
Sales for the past four calendar years follow:				
Years Ended Dec. 31	1920	1919	1918	1917
Passenger Cars:				
Buick	111,215	115,405	74,856	117,300
Cadillac	19,826	19,801	12,279	19,692
Chevrolet	126,397	127,362	81,435	109,111
Oakland	36,155	51,901	24,110	33,951
Oldsmobile	25,713	33,345	18,822	22,045
Scripps-Booth	8,779	8,128	4,058	2,545
Commercial Cars:				
Chevrolet trucks.....	13,651	6,098	384	2,664
GMC trucks.....	5,137	7,729	8,997	5,861
Oldsmobile trucks.....	8,239	7,782	30	15
Totals:				
Passenger cars.....	328,085	355,942	215,510	304,644
Commercial cars.....	27,027	21,609	9,411	8,540
Miscellaneous*	36,421	28,607	21,913	11,319
Grand total.....	391,533	406,158	246,834	324,503

*Consists of tractors; McLaughlin, Chevrolet and Olds cars produced and sold in Canada, and therefore not included in reports to National Automobile Chamber of Commerce; and also Buick and Cadillac commercial cars.

Manufacture Fast Becoming Fine Art

Some Detroit Plants Sacrificing Schedules to Keep Product at High Standards

DETROIT, Aug. 23—Automobile manufacturing to-day is nearer the fine art period than at any time in its history. With the rush for production steadied down to a regular demand, the factories are concentrating on turning out the very best product possible at the price.

In some factories such extreme care is being exercised that it often happens daily production schedules are sacrificed to keep the product up to high standard. This is in spite of the fact that daily production is based on sales, and failure to meet schedules means falling behind.

Building for the future is the watchword of the industry to-day. Every bit of material and work is carefully inspected, and parts or assembly work which fail to come up to requirements are turned back for rebuilding. Nothing is being passed about which there is any doubt, and every automobile turned out represents a 100 per cent perfect job.

In this fine building period the industry is benefited greatly by the high class of workmen now available. The type of man found in the automobile factories to-day is probably the most expert mechanical type in the country. The industry has had the pick of many industries owing to the general depression and it has made the best of it.

The indifferent worker who found place during the exigencies of the post-war rush is gone. In his place is the highest type workman the industry has known. The honor system is largely prevalent, each man being relied upon to see that his end of the work matches up with general excellence of the completed job.

There is no such thing to-day as labor turnover in the sense that applied during the rush period. Men are not leaving their jobs to-day voluntarily. Jobs are at a premium, and as a result the factories are getting better co-operation than they have in years, and all of this is reflected in the finished car.

Delay Building Truck Plant for Harvester

FORT WAYNE, IND., Aug. 20—Construction work on the motor truck plant of the International Harvester Co. in this city will not be started until next spring. An extension of eight months has been granted by the Greater Fort Wayne Development Corp. which has a contract for the building.

That the plant will be developed according to the original plans is indicated in the following letter from the Harvester company:

"In requesting this further extension we desire to assure the Development company and all concerned that our com-

pany has never entertained for a moment any doubt of ultimate execution of the contract referred to or of the carrying out of its plans for the development of a Fort Wayne plant as heretofore declared to you. With us the question is solely one of time. Our reason for asking this further extension is to be found as before in the present and prospective conditions of our business, of finance and of building costs."

No Angus Sanderson Cash to Creditors

LONDON, Aug. 12 (*By Mail*)—Creditors and shareholders of the Angus Sanderson Co. were told this week the sad story of the failure of an enterprise which began as a well-paying, high-class body building business and agency for high-grade cars, but which joined later with associated interests to produce the Angus Sanderson car.

The car production business began with the purchase of the Birtley projectile factory with 51 acres of land in 1919 for \$1,125,000 (normal exchange), payable part in cash and the remainder in 10 yearly installments. In April, 1920, a loss of \$946,590 had been incurred and on Dec. 20 of that year there was a further loss of \$817,715.

The accounts filed in the proceedings disclosed total liabilities of \$4,442,465. The total deficiency in regard to stockholders is \$1,513,325. Representatives of the debenture holders stated at the meeting it was doubtful whether there would be anything for the creditors, as the assets probably would lack \$400,000 of being sufficient to pay even the debenture holders.

No statement was made as to the cause of the failure, but the creditors expressed the view that it was due entirely to mismanagement.

The business will be liquidated by the official receiver, but the manufacture of Angus Sanderson cars is being continued with new financial aid in the works of the Tylor Co. in North London, and the output is declared to be increasing.

Plan Distribution of Hayes Wheel Products

DETROIT, Aug. 22—National distribution of Hayes Wheel Co. products was discussed at a meeting of executives and distributors held at the Jackson factory, this month. In connection with the meeting an exhibit of wheels and component parts was shown, the new demountable at rim wheel being featured. The company plans to build its business in the United States and abroad around this type of wheel.

Addresses by dealers and officials showed complete confidence in the future of the automobile business in general and the wheel part of it in particular. Among those who spoke were W. D. Blood, head of W. D. Blood Co., New York, export agents for Hayes products; President C. B. Hayes, G. S. Porter, Sargent Ziegenbien, C. F. Field and Brundage.

\$70,537,620 Assets for Maxwell Motor

First Financial Statement Issued by New Organization—Presi- dent Wilson Talks

DETROIT, Aug. 22—The first financial statement issued by the new organization of the Maxwell Motor Corp. shows total assets of \$70,537,620.28, as of June 1. Cash in bank and receivable from the reorganization committee totals, with certificates of deposit, \$7,931,361.34. Inventory stands at \$16,166,867.05. Current assets are shown as \$28,615,098.87, as against current liabilities of \$1,855,179.98.

Commenting on the statement, President W. R. Wilson said:

"Assets in plants and equipment have been conservatively valued and adequate depreciation maintained, and the value of inventories has also received depreciation consistent with the fall of market prices, with substantial allowance for any further loss from this or other causes.

"Inventories of the corporation are only a little more than 60 per cent of those of the old company a year ago, and sales have been affected to such an extent that the number of cars and trucks in inventory is only slightly in excess of daily production, and the number of cars in the hands of distributors and dealers throughout the country is less than normal.

"Your corporation embarks upon its undertaking with bright prospects. During the immediate future and pending the return of better business efforts will be concentrated upon further improvement of the company's product, reduction of cost, conservation of cash, welfare of its distributors and dealers, and consolidation of its position. In other words, efforts of general preparedness for the increased volume of business which it is believed will be available in the industry within the next twelve months period."

Dutch East Indies Now Fertile Motor Car Field

SEATTLE, Aug. 22—Information received here from Batavia, Java, shows that the Dutch East Indies present one of the most fertile fields in the Pacific Ocean trade mart for American motor vehicles. The total number of automobiles in use in the Dutch East Indies is now estimated at 15,500. Since 1915 nearly all of the cars imported have been of American manufacture.

One of the features of the automotive trade in Java, the chief island of the group, is the development of motor truck transportation. Between Sorabaya, one of the leading ports, and Tandjung Perak two hundred motor trucks are now required to take care of the daily freight traffic. The trucks are of 1½ to 2 tons capacity.

The market in the Dutch East Indies for tires is also very good under normal conditions. Imports of tires last year numbered more than 200,000, as compared with 94,508 during 1918.

Bay State in Throes of a Headlight Law

Lens Makers Working Night and Day But Cannot Supply Demand

BOSTON, Aug. 23—Massachusetts is now in the throes of a headlight law with a scarcity of lenses to meet it, and thousands of motorists are going about frantically trying to get what they want in the way of new lights. Many of them waited until the last minute, as they do in registering. And the makers of lenses have been working night and day to get goods here, but not enough were available. One lens man stated that if he had 10 carloads in Boston, dealers from all over the State and from some of the other States would be racing in to get their share, fighting with the Boston dealers anxious to take the whole shipment.

Time for Hustling

It is a time of hustle and make money for the accessory people, and some of the car dealers have taken a hand in adding a little money to their finances by selling bulbs and lenses, also doing a focus business. All over the State men are opening up focussing stations and charging from 50c. up to take care of motorists' wants. General focussing costs an average of about \$1. Then there is the profit on the sale of 21 candlepower bulbs, and lenses. Also there is shop work when brackets are to be bent down. As one accessory man remarked to-day, discussing the sales: "God and the highway commission were good to us just when we needed help."

A lot of the motorists are trying to do their own focussing and the placing of the lenses. The State Motor Vehicle Department has had printed some cards giving directions for doing this work. But some of them are not having much satisfaction as they have bought the wrong size lens, or do not know how to put them in properly, with the result that it is not unusual to find on main traveled roads broken lenses every few hundred yards, or meet with cars whose lights are out of focus.

Warning Tags for Cars

It is doubtful if the law will be of much use for several weeks. Meanwhile the police chiefs of Massachusetts have all received letters with a lot of warning tags to place on cars not properly fitted with lenses when they see them parked by day. These warning tags will tell the owner he cannot operate his car at night until it meets the law's requirements, and the number is sent to the Motor Vehicle Registrar's office where it will be checked up. A second report of not being equipped will cause suspension of the license to drive, and perhaps the registration of the car. The owner, too, will be in jeopardy if he has an accident, for not being lawfully equipped and the burden of blame would be on him.

Exports of Automobiles, Airplanes, Trucks, Farm Tractors, Motorcycles and Parts for July and Six Previous Months

	Month of July				7 Months Ending July			
	1920		1921		1920		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	12	\$55,110	...	...	41	\$381,204	30	\$193,775
Airplane parts .....	...	34,174	...	\$2,444	...	505,238	...	113,573
Commercial cars	2,042	3,434,070	399	314,237	18,333	28,582,566	5,092	7,798,907
Motorcycles	2,299	608,030	441	124,523	23,373	6,308,949	8,398	2,800,160
Passenger cars	13,320	16,220,965	2,224	1,873,368	88,640	98,059,062	19,466	22,242,514
Parts, not including engines and tires .....	...	5,394,350	...	1,952,525	...	48,998,975	...	26,768,707
ENGINES								
	Month of July		1921		7 Months Ending July		1921	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobile, gas	3,181	\$594,809	415	\$108,472	24,986	\$4,051,310	5,812	\$1,195,920
Marine, gas	917	316,261	265	85,545	6,466	2,043,696	3,222	1,166,716
Stationary, gas	2,466	460,866	433	123,350	17,546	3,041,152	7,094	1,721,952
Tractor, gas	2,145	1,911,903	16	29,082	13,834	13,573,810	2,624	3,282,254
Total	8,709	\$3,283,839	1,129	\$346,449	62,832	\$22,709,968	18,752	\$7,366,842

Seizure of "Hooch" Cars Worries Southern Dealers

BIRMINGHAM, ALA., Aug. 20—Action on the part of county and federal authorities of condemning automobiles seized for carrying alcoholic liquors in violation of the prohibition laws is giving dealers in this district no small amount of trouble.

The latest instance is a car sold by the Pryor Motor Co. on which there was a balance of \$1,250. This car was not in possession of the buyer when seized for alleged transportation of whiskey. It was taken by deputy sheriffs and was being turned over to federal authorities for condemnation and sale at auction when the Pryor company got an injunction to prevent this action.

When cars are thus turned over to federal authorities without the lien held by the company selling it being filed in court, the company has no claim on it. It was for this purpose the injunction was secured.

If motor companies file their liens in time there is a chance of recovering their cars, but many times they are ignorant of the seizures and cannot do so.

While most of the cars used for the purpose of illicit liquor traffic are second-hand ones, a number of dealers have lost high priced cars through seizure. They were, of course, unaware that their cars were being used for such purposes.

HENDEE FILES PROTEST

SPRINGFIELD, MASS., Aug. 20—The Hendee Mfg. Co. of this city, motorcycle manufacturer, it is announced, has filed a protest with the Senate Finance Committee at Washington, protesting against the proposed duty on bicycles, motorcycles and parts, as contained in the Fordney bill, saying that in common with other manufacturers the company believes the provision would harm the industry. The company states that foreign competition is not feared and, furthermore, would stimulate the industry.

Scandinavian Trade Looks Better for 1922

STOCKHOLM, Aug. 5—(By Mail)—While the 1921 automobile season has been the worst on record in Scandinavia, indications are that with the improvement in general conditions the market will be much stronger next February and March. The public has awakened to the fact that American cars are best suited for use in Norway and Sweden, as the motor car driver in these countries needs power more than anything else.

There is no market in prospect for trucks of any size above 2½-ton capacity. Buyers now all specify pneumatic tire equipment. Electric lighting is asked for, but not electric starters in all cases. Buyers favor low frame height to facilitate loading and discharging. American manufacturers should consider the double pneumatic tire and rear equipment similar to that of the Fiat and should not let tire sizes exceed 33 x 4½.

The conditions generally are brighter than they have been in the country in some time past.

REDUCE VICTOR TRUCK CLAIM

DETROIT, Aug. 22—The claim of Alfred F. Rick of Baroda against the Victor Truck Co., St. Joseph, Mich., has been reduced by the referee in bankruptcy from \$40,160 to \$8,946. Rick was treasurer of the company. A claim for stock which the company was said to have given gratis was disallowed on the ground that no corporation could give stock to officers or directors without adequate consideration.

ASK CLAIRMONT RECEIVER

INDIANAPOLIS, IND., Aug. 22—Judge Solon J. Carter of Superior Court, this city, has been asked to appoint a receiver for the Clairmont Reynolds Body Co. The petition for a receiver was asked by Alva C. Robbins.

Flying Exhibition to Be Held in Paris

French Airplane Manufacturers Expect to Cover All Phases of Industry

PARIS, Aug. 12 (*By Mail*)—French airplane and kindred manufacturers will hold an aviation exhibition in the Grand Palais, Paris, from Nov. 12 to 27. This event will unite all types of flying machines and will cover every phase of aerial navigation.

The first international aerial navigation congress in Europe is announced during the period of the Paris aviation show, from Nov. 15 to 26.

The congress is divided into two sections, dealing respectively with the techniques of flying and aerial navigation. Eight main subjects are provided for in the discussions, as follows: (1) Application on full size machines of results obtained on small models in the aerodynamic wind tunnel. (2) Commercial airplanes and flying boats; thick and thin wings; all-metal construction. (3) Big capacity airships. (4) Airplane engines for commercial services. (5) Instruments for plotting an aerial route and determining position. (6) The formation of aerial highways; the installation of airdromes and their operation. (7) Commercial aerial navigation; organization and operation of aerial transport lines; aerial mail. (8) Aerial traffic regulations; examination of pilots; safety; insurance.

Jersey City Will Have Motor Show This Year

JERSEY CITY, Aug. 20—Jersey City will have another automobile show this year, its second, the success of the initial one held last fall being so great it incited the members of the Hudson County Automobile Trade Association, who sponsored the event, to even greater efforts than they made last year. As in 1920, the display will be held in the Fourth Regiment Armory, and the demand for space greatly exceeds that of the first exhibition. At least 25 makes of passenger cars will be on view, every one of them representative products of the leading American manufacturers. There will also be a display of accessories worthy of inspection, while special days will include many features, the programs of which will be announced later.

Elmer E. Hallinger is president of the Hudson County Automobile Trade Association this year and he will be ably assisted by his fellow officers in carrying out the organization's plans. These include A. R. Southworth, vice-president; H. V. Lehman, treasurer; A. W. Elder, secretary, and Duncan Stuart, recording secretary. F. W. Payne, who was manager of the show last year, has again been retained in the same capacity.

Complete Program of State Fairs Scheduled Throughout United States During 1921-1922

- Alabama**—State Fair, Birmingham, Oct. 3-8.
Arizona—State Fair, Phoenix.
California—State Fair, Sacramento, Sept. 3-11.
Canada—Calgary Industrial Exhibition, Calgary, June 30-July 8; Canada's Great Eastern Exhibit, Sherbrooke, Que., Aug. 27-Sept. 3; Canadian National Exhibition, Toronto, Ont., Aug. 27-Sept. 10; Central Canada Exhibition Association, Ottawa, Ont., Sept. 9-19; Edmonton Exposition, Edmonton, Alberta, July 8-16; Quebec Provincial Exposition, Quebec-Next Westminster, B. C., Sept. 12-17; Vancouver Exposition, Vancouver, B. C., Aug. 13-20; Western Fair, London, Sept. 10-17.
Colorado—State Fair, Pueblo, Sept. 26-30; National Western Stock Show, Denver, Jan. 14-21, 1922.
Connecticut—Connecticut Fair Association, Hartford, Sept. 5-10.
Florida—State Fair, Jacksonville.
Georgia—State Fair, Macon, Oct. 27-Nov. 5; Southeastern Fair Association, Atlanta, Oct. 15-25.
Idaho—State Fair, Boise, Sept. 26-Oct. 1.
Illinois—Illinois and Indiana Fair Association, Danville, Aug. 27-Sept. 3; State Fair, Springfield, Aug. 19-27; International Live Stock Association, Chicago, Nov. 26-Dec. 3; Kankakee Inter-State Fair, Kankakee, Aug. 15-19.
Indiana—State Fair, Indianapolis, Sept. 5-10; Inter-State Fair Association, South Bend, Sept. 12-17.
Iowa—Inter-State Fair, Sioux City, Sept. 18-24; Iowa State Fair and Exposition, Des Moines, Aug. 24-Sept. 2; National Swine Show and Exposition, Des Moines.
Kansas—State Fair, Hutchinson, Sept. 17-23; Free Fair, Topeka, Sept. 12-17.
Kentucky—State Fair, Louisville, Sept. 11-17.
Louisiana—State Fair, Shreveport, Oct. 27-Nov. 6.
Maryland—Hagerstown Interstate Fair, Hagerstown.
Massachusetts—Eastern States Exposition, Springfield, Sept. 13-24.
Michigan—State Fair, Detroit, Sept. 2-11.
Minnesota—State Fair, Hamline, Sept. 3-10; South St. Paul Stock and Feeder Show, South St. Paul.
Missouri—American Royal Live Stock Show, Kansas City, Nov. 12-19.
Mississippi—State Fair, Jackson, Oct. 17-22; Mississippi-Alabama Fair, Meridian, Oct. 19-15.
Montana—Midland Empire Fair, Billings, Sept. 19-23; State Fair, Helena, Sept. 12-17.
Nebraska—Ak-sar-ben, Omaha, Sept. 13-24; State Fair, Lincoln, Sept. 4-9.
New Jersey—Trenton Interstate Fair of New Jersey, Trenton, Sept. 26-30.
New York—State Fair, Syracuse, Sept. 12-17; Rochester Exposition, Rochester, Sept. 5-10.
North Carolina—State Fair, Raleigh, Oct. 17-22.
North Dakota—State Fair, Grand Forks, July 18-23; State Fair, Fargo, July 11-16.
Ohio—State Fair, Columbus, Aug. 29-Sept. 3.
Oklahoma—Free State Fair, Muskogee, Oct. 3-8; State Fair and Exposition, Oklahoma City, Sept. 24-Oct. 1.
Oregon—State Fair, Salem, Sept. 26-Oct. 1; Pacific International Live Stock Exposition, Portland, Nov. 5-12.
Pennsylvania—Erie Exposition, Erie, Aug. 22-27.
South Carolina—State Fair, Columbia, Oct. 24-28.
South Dakota—State Fair, Huron, Sept. 12-17.
Tennessee—Chattanooga Interstate Fair, Chattanooga, Oct. 1-8; East Tennessee Division Fair, Knoxville, Sept. 26-Oct. 1; Memphis Tri-State Fair, Memphis, Sept. 24-Oct. 1; State Fair, Nashville, Sept. 17-24; West Tennessee District Fair, Jackson, Sept. 12-17.
Texas—South Texas State Fair, Beaumont, Nov. 10-19; Southwestern Exposition and Fat Stock Show, Fort Worth, March 5-12, 1922; State Fair, Dallas, Oct. 8-23; Texas Cotton Palace Association, Waco.
Utah—State Fair, Salt Lake City, Oct. 3-8.
Vermont—State Fair, White River Junction, Oct. 3-6.
Virginia—Staunton, Virginia, Fair, Staunton, Sept. 5-10; State Fair, Richmond, Sept. 1-8.
Washington—Spokane Interstate Fair and Live Stock Show, Spokane, Sept. 5-10; State Fair, Yakima.
West Virginia—State Fair, Wheeling, Sept. 5-10.
Wisconsin—Northern Wisconsin State Fair, Chippewa Falls, Sept. 12-16; State Fair, Milwaukee, Aug. 29-Sept. 3.
Wyoming—State Fair, Douglas, Sept. 13-16.
- ADDITIONAL FAIRS**
 Blue Grass Fair Association, Lexington, Ky., Sept. 5-10.
 International Wheat Shows, Fair and Exposition, Wichita, Kan., Sept. 26-Oct. 3.
 Inter-State Fair, La Crosse, Wis., Sept. 2-23.
 Ozark Stock Show, Springfield, Mo., Oct. 3-8.
 Dairy Cattle Congress and International Belgian Horse, Waterloo, Iowa, Sept. 26-Oct. 2.
 National Dairy Show, St. Paul, Minn., Oct. 8-15.
 National Implement and Vehicle Show and Peoria District Fair, Peoria, Ill., Sept. 30-Oct. 8.
 National Swine Show, Peoria, Ill., Oct. 3-8.
 West Michigan State Fair, Grand Rapids, Mich., Sept. 17-22.

Buenos Aires Seeking License Plate Samples

WASHINGTON, Aug. 24—The municipality of the city of Buenos Aires, Argentina, desires samples or models of luminous number plates for automobiles for use in that city. The text of the invitation is available to manufacturers and others interested from the Bureau of Foreign and Domestic Commerce. It is stated a business of considerable volume should be afforded for the successful contestant.

Survey Shows Need for Canadian Lines Abroad

OTTAWA, ONT., Aug. 20—Acting on instructions from the Trade and Commerce Department, L. E. Wolgess, Canadian Government Trade Commissioner, has visited Roumania, Hungary, Czechoslovakia, Austria, Turkey and Jugoslavia and the trade report has now been issued in book form under the title of "Trade of the New Countries of Southeast Europe." A list of possible openings for Canadian goods is supplied.

METAL MARKETS

A HIGHLY interesting period in the shaping of the steel market is imminent. While August statistics of production and unfilled tonnages are not likely to disclose startling gains, they will undoubtedly reflect the turn for the better that has come over the market, and it remains to be seen how the minds of the rank and file of producers will react to this changed order of things, following the dreary months through which the industry has passed. While the large interests, far from building castles in the air, recognize only too well that the demand is still a plant of very tender growth, calling for the most careful nursing, one encounters here and there smaller producers whose psychological make-up is such as to preclude interpretation of even slightly increased production, and orders in any other light than as a forerunner of a rising market or justification for such advances. There are those whose minds lean in this direction and who even now point to the pig iron market as an example that rising values beget of themselves more active demand. They make much of the fact that at \$18 pig iron went begging, whereas now that the market has recovered to approximately \$20, there is a relatively active demand in evidence. They overlook, however, that, although it is difficult to dissociate steel from its chief raw material, the pig iron and steel markets have very little in common as to marketing conditions. The former, even in normal times, is more or less susceptible to semi-speculative influences, whereas the latter is amid ordinary conditions a manufacturing affair in which regularity of outlet is of far more importance than ephemeral gains. That the representative elements in the steel industry are not permitting their judgment to be warped by the slightly better appearance of things, may be seen from the intensive competition that is in evidence for orders of attractive tonnage, specifications and delivery conditions. Concessions, it is true, have narrowed down perceptibly for the simple reason that in the case of many mills selling prices represent levels very close to production costs; but, if any buyer were to utilize the last few days of September in an effort to ascertain what he might be able to obtain sizable tonnages of steel at, say for October shipment, he would undoubtedly be able to shade conventional quotations by \$3 a ton and upwards.

Pig Iron.—The market's advancing tendency is gaining momentum. The misfortunes that befell the pig iron market when it crossed the \$40 level are still fresh in the trade's mind and should act as a brake on too ambitious and premature efforts to enhance values unduly.

Steel.—Again the United States Steel Corp. ratified by official announcement made late on Wednesday its policy of meeting all price cuts by independents, revising its "official" sheet prices downward for that purpose. Producers of cold-rolled strip steel are energetically competing with one another for what orders emanate from the automotive industries. Four cent, base Pittsburgh, appears, however, to be the lowest quotation extant, although mills are apt to do a lot of figuring before they would turn down an order for, say 300 tons, at an even lower bid price.

Aluminum.—Although the automotive industries are reported to be working up more metal and sheets, fresh demand has not broadened, most consumers still having considerable stocks and material due on old contracts. A London report says that Ger-

man aluminum production is now at the rate of 15,000 tons a year, compared with 800 tons before the war. The leading Norwegian producer has appointed a selling agent in the United States.

Copper.—A slight improvement is noted in the number of domestic buyers, but the aggregate tonnages going into this channel are still negligible.

Lead.—The market presents a routine appearance.

Zinc.—Dulness persists and the market continues feeble.

INDUSTRIAL NOTES

Federal Automotive Sales Co. has been incorporated to become distributor of Penberthy products in Ohio, Michigan, Illinois and Indiana. Headquarters of the sales company will be in Detroit with other offices in Cleveland and Chicago. Officers are E. H. Janes, president; R. P. Flower, vice president, both formerly with Interstate Foundry Co., and Walter C. Voss, secretary-treasurer, formerly with Standard parts.

Peninsular Tire & Rubber Co., Tampa, Fla., has announced that the company will shortly begin the construction here of a new \$200,000 plant. The building will be two stories, 100 x 300, and in addition a small office building and a storage building are also to be constructed. The initial capacity of the plant will be about 300 tires daily. The company was recently incorporated at Tampa with \$1,000,000 capital.

Mason Tire & Rubber Co., of Kent, O., will purchase in the near future the cotton mills of the Quitman Mfg. Co., at Quitman, Ga., to be operated as a unit of the tire plant for the manufacture of the various fabrics made from cotton that are used in the making of tires. The Ohio company has been investigating a number of southern cotton mills recently with a view to purchasing a plant.

Viking Motors Corp., Detroit, has been organized with a capital stock of \$100,000 to make airplanes and airplane engines and establish transportation routes. Officers are R. L. Bailey acting president; Fred H. Aldrich, secretary, and R. L. Bailey, treasurer. D. E. Briggs is to be general manager and E. B. Carns, aeronautical engineer.

Columbia Body Corp., Detroit, has acquired the American Chemical Co.'s plant and is moving. The company has been given permission to sell \$200,000 in stock.

International Harvester Co. of Canada, Ltd., Chatham, Ont., is equipping its wagon and sleigh plant to manufacture International motor trucks.

PORTAGE TO GET FIRM BACK

PORTAGE, WIS., July 20—The Six Wheel Truck Co., Fox Lake, Wis., which has been manufacturing a new type of truck with dual sets of rear wheels for some time on a limited scale, has accepted the offer of business men of Portage, Wis., to relocate in that city. Portage capital is taking a large financial interest and will provide quarters for a machine shop and assembling floor. Portage is a leading railroad center in the interior of Wisconsin. The Six Wheel truck was designed by F. N. Pettegrew of Fox Lake, who will be vice-president and general manager of the concern in its new location. The truck is designed especially for heavy duty hauling.

Stevens-Duryea Cuts
Prices of 4 Models

Five Hundred Men Put to Work
in Plant at Springfield, Mass.

—Other Price Cuts

SPRINGFIELD, MASS., Aug. 22—Stevens-Duryea has cut the price of its seven passenger touring car to \$6,800; its vestibule limousine to \$8,600; four passenger touring to \$6,900 and chassis to \$5,600, effective Sept. 1. Five hundred men are at work at the plant.

CUT HARVEY TRUCKS

HARVEY, ILL., Aug. 19—Harvey Motor Truck Co. has cut the prices on its 3½-ton truck to \$3,950 and its 5-ton truck to \$4,500.

PIEDMONT CUTS TRUCKS

LYNCHBURG, W. VA., Aug. 23—The Piedmont Motor Car Co. has decided to reduce the price of its 4-30 model from \$1,270 to \$970 and of its 6-40 model from \$1,495 to \$1,285.

Lehigh Rubber Opens
Manufacture of Tires

NEW CASTLE, PA., Aug. 22—The Lehigh Rubber Co., backed by Frank Seiberling, former Goodyear head, has now begun the manufacture of tires. H. W. Smith, the general manager, says 100 men are already employed and that the company intends building up production to 1000 tubes and 500 casings daily.

The capacity of the plant, with full force, is 2000 casings and 3000 tubes.

LATEST MODELS AT FAIR

PITMAN, N. J., Aug. 22—Although the twenty-eighth annual fair and picnic of Gloucester County granges opened in the rain, the attendance was good, and "machinery row" was thronged with a rain-coated delegation. Latest models in several makes of farm tractors, motor trucks and automobiles were the center of attraction.

Automotive men present were optimistic as to outlook for future business and were pleased with the interest taken in the exhibits of the tractors, motor trucks and passenger cars.

W. U. TAKES INSURANCE

CHICAGO, Aug. 22—Effective Sept. 1, the Western Union will assume full jurisdiction over automobile insurance in its territory. This action was taken as a result of the special meeting of the union Dec. 9, 1920. Jurisdiction will be assumed over rules, commissions and regulations connected with the business. The Western merit schedules will be mandatory upon automobile business after Sept. 1.

MEN OF THE INDUSTRY

Wainwright Engineering Corp., Connersville, Ind., has announced more changes. Walter Duda, formerly sales manager of the Faeth Co., Kansas City, Mo., has been made sales manager; Joseph F. O'Brien, formerly with the Gibson Co., Indianapolis, is now chief of the order department; John D. Carmody has been made district manager of the Pacific Coast territory, with headquarters in San Francisco. For eight years he was district manager for the Champion Spark Plug Co.

Frank Johnson, a member of the engineering staff of Cadillac Motor Car Co. from 1901 to 1917, has rejoined his former company, after having served as chief engineer of Lincoln Motor Co. from 1917 to 1920. From 1901 to 1906 Johnson was chief draftsman and designer for Cadillac, and from 1906 to 1917 was designer on all chassis and engine parts. He designed every engine used by Cadillac to the introduction of the eight, and was a part designer of that.

Klaxon Co. of Newark, N. J., has placed C. E. Vaughn, assistant sales manager, in charge of the middle and northwestern territories. Vaughn goes into this new field with a thorough knowledge of Klaxon methods gained both on the road and in the office of the plant. He will open offices in Chicago.

Charles M. Steele, formerly of the Carl M. Greene Advertising Agency of Detroit, will be the new advertising manager of the Studebaker Corp., with headquarters in South Bend. He was at one time advertising manager of the Saxon Motor Co.

L. F. Kedzie, purchasing manager of the Mercer Motors Co., Trenton, N. J., has resigned, due to a reorganization of the Mercer company. Kedzie was formerly assistant purchasing manager of the Packard Motor Car Co. of Detroit.

Clarence T. Warner, general manager of the Michigan State Investment Co., Benton Harbor, has resigned to become president of the Warner Auto Equipment Co., which will manufacture a shock absorber with factories in Benton Harbor.

Roy Hood has resigned as purchasing agent for Everitt Bros. to become director of purchases for Rickenbacker Motor Car Co., Detroit, of which he will also be a director.

Victor Bresler of Detroit has been selected by Lexington Motor Co. to study business conditions and the export market for cars in India, Egypt, South Sea Islands, China and Europe.

Howard A. Coffin, formerly secretary of the Detroit Pressed Steel Co. and manager of the Distel Wheel Division, will become the vice-president of the White Star Refining Co. Sept. 1.

Glenn B. Hiller, general sales manager of the American Motor Truck Co., Newark, Ohio, has resigned to take effect Sept. 1. Mr. Hiller has not announced his future plans.

W. W. Helte, Detroit branch manager of International Motor Truck Corp., has been transferred to the New York office.

Harland M. Wirth has resigned as director of purchases of the Kelsey Wheel Co., Detroit.

FINANCIAL NOTES

Wood Rubber Co. has declared regular quarterly dividend of 1% per cent on pre-

ferred stock, payable Sept. 1 to stock of record Aug. 2.

White Motor Co., Cleveland, has declared the regular quarterly dividend of \$1, payable Sept. 30 to stock of record Sept. 15.

Find Industrial Field
Tractors' Best Market

ATLANTA, GA., Aug. 20—While a few tractors are being sold for agricultural use in the Southeast this summer, managers for the manufacturers in this district, most of whom have their southern branches in Atlanta, agree that the primary market for the past few months has been in the industrial field, principally for use in factory yards and in road construction.

The lumber industry, ordinarily an excellent market for tractor sales in this section, has experienced such a long period of depression that but few sales are being made to this industry or have been made for some months. A large number of the mills in the Southeast have remained closed for a long time, and, while lumber conditions are gradually improving, there is little chance of this market assuming proportions to make sales effort worth while before the latter part of the year and possibly not before next year.

The revival of activity among the industrial plants of the section is having a favorable effect on tractor sales, and many plants are purchasing them for use in the yards and about the factories. A considerable amount of road construction is going on in the Southeast, and tractor sales in this field have been very good for several months.

The consensus of opinion among the local branch managers is that there will be little demand in agricultural lines until cotton reaches a much higher figure than the present market offers, which will probably be toward the latter part of the year.

Motor Excise Taxes
Fall Off \$23,377,031

WASHINGTON, Aug. 24—Excise taxes assessed on automobiles for the fiscal year of 1921 fell off by \$23,377,031.63, according to preliminary statistics issued by the Treasury Department. The total yield for the past fiscal year of excise taxes on automotive equipment amounted to \$115,545,760.38. The effect of excise taxes in general was illustrated in the fact that the yield declined approximately \$36,000,000 since 1920.

Noma Motor Reduces
Prices of All Models

NEW YORK, Aug. 25—Noma Motor Corp. announces price cuts as follows:

	Old Price	New Price
2 passenger	\$3,000	\$2,800
4 passenger	3,200	2,850
6 passenger	3,500	3,200
Sedan	4,350	3,700

No changes have been made in specifications.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

NEW YORK, Aug. 24—The publication of the latest index numbers of prices indicates that some degree of price stabilization has been reached. According to Bradstreet's index, wholesale prices rose 3.07 per cent during July, as compared with a rise of 1.05 per cent during June. The rise in June was the first since May, 1920, and the continuation during July strengthens the belief that there is a tendency toward stabilization. This is borne out by Dun's index number, which rose 2.41 per cent during July, the first increase made since May of last year. The Bureau of Labor's index number showed no change. The advance for the month was caused in the main by higher prices for foodstuffs and, to a less degree, by higher prices for textiles. Metals show a distinct decline. What price changes have occurred have been of a character to level out the unevenness of prices and indicate a drift toward stabilization.

The figures presented by Secretary Davis to the Senate regarding the state of unemployment in the country indicate that workers are not yet, as a whole, returning to the factories and mills. His figures, which are merely estimates, show that there are 5,735,000 persons without work in the United States, of which a great majority are employees in the manufacturing and mechanical industries. These latter, including the building trades, have, according to Secretary Davis, 3,900,000 employees now out of work, while the number of transportation workers similarly unemployed amounts to 800,000; trade and clerical workers, 450,000; miners, 250,000, and domestic and personal service employees, 335,000. The greater number of unemployed includes women, girls and boys, who since March of last year, when we were at the peak of industrial activity, have returned to non-profitable employment at home or to school.

Due largely to the continued accession of gold, the Federal Reserve system shows further improvement. The ratio of total reserves to deposit and Federal Reserve note liabilities, combined, of the whole system increased last week from 65 per cent to 65.8 per cent, the highest in more than three years. Gold reserves increased \$24,394,000, while total bills on hand declined \$17,610,000, largely due to fewer discounted commercial bills, and total earning assets decreased \$32,073,000. Federal Reserve notes in circulation declined \$17,142,000. The improvement in the position of the New York Federal Reserve bank was even more marked, the ratio of gold reserves to Federal Reserve notes in circulation, after setting aside 35 per cent against deposit liabilities, was at 108.7 per cent, the highest in the history of the bank.

While seasonable demands for crop-moving funds have been increasing recently, there was last week an easier tone in the money market.

Calendar

SHOWS

Sept. 5-10—Indianapolis, Automobile and Accessory Show in conjunction with Indiana State Fair conducted by Indianapolis Automobile Trade Association, John B. Orman, Mgr.

Sept. 28—Oct. 8—New York, Electrical Exposition, 71st Regt. Armory, Electric Equipment, Machinery and Vehicles.

Nov. 14-19—Jersey City, Second Annual Automobile Show of Hudson County Automobile Trade Association, Fourth Regiment Armory.

Nov. 27-Dec. 3—New York, Automobile Salon, Hotel Commodore.

January—Chicago, Automobile Salon, Hotel Drake.

Jan. 7-13—New York, National Automobile Show, Madison Square Garden, Auspices of N.A.C.C.

Jan. 28-Feb. 2—Chicago, National Automobile Show.

Coliseum, Auspices of N.A.C.C.

Feb. 20 to 25—Louisville, Ky., Louisville Automobile Show, Auspices Louisville Automobile Dealers Association.

Sept. 9 to 17—Ottawa, Ont., Can.—Ottawa Motor Show.

Feb. 6 to 11—Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

September—Buenos Aires, Argentina, Passenger Cars and Equipment, La Pabellon de las Rosas, Automovil Club Argentino.

September—Buenos Aires, Argentina, Cars, Trucks, Tractors, Farm Lighting Plants and Power Farming Machinery, Palermo Park; Sociedad Rural Argentina.

September—Luxemburg, Luxemburg, Agricultural Sample Exhibition.

Sept. 5, 1921—Constantinople, Traction trials under the direction of the Turkish Ministry of Agriculture.

Sept. 23-Oct. 2—Berlin, German National Automobile Show, Auspices of German Automobile Mfg. Ass'n and German Automobile Club.

Oct. 5-16—Paris, France, Paris Motor Show, Grand Palais, Administration de l'Exposition Internationale de l'Automobile, 51, Rue Pergolèse, Paris.

Nov. 4-12—London, British Motor Show, Society Motor Mfrs. and Traders.

November 7-14—Paris, Seventh International Exposition of Aerial Locomotion in the Grand Palais of the Champs Elysees, Held by the Chambre Syndicale des Industries Aeronautiques.

March, 1922—Santiago, Chili, Annual Automobile Show.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador, Automotive Section.

Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Association Automobilsta Brasileira.

CONVENTIONS

Sept. 14-15-16—Detroit, Credit Convention Motor and Accessory Manufacturers Association.

Oct. 12-14—Chicago, Twentieth Annual Convention National Implement & Vehicle Ass'n.

Nov. 22—New York, Convention of Factory Service Managers, National Automobile Chamber of Commerce.

Dec. 27-29—Chicago, American Society of Agricultural Engineers, Auditorium Hotel.

RACES

Labor Day—Uniontown, Pa., Autumn Classic.

Bosch Magneto to Go into Lighting Field

SPRINGFIELD, MASS., Aug. 24—Reports for some time current that the American Bosch Magneto Co. of this city has closed a deal for production of automobile lighting and starting systems that will make this corporation the largest manufacturers of these lines in the world has been confirmed by President Arthur T. Murray at his office here. However, he said that he is unprepared to give out details.

In reply to a question as to whether the contract will mean a longer working schedule at the local plant, he replied that he does not believe that it will. He explained that, according to present outlook, the larger part of the contract will be handled at the corporation's Cambridge, Mass., plant. An unconfirmed report from Boston is to the effect that the contract in question involves about \$3,500,000 and is from the manufacturers of the Hudson and Essex automobiles.

Bus Companies of Ohio Take New Law as Joke

TOLEDO, Aug. 20—The Graham law in Ohio which has put the motor buses operating in inter-city business under the Public Utilities Commission seems to be treated as a joke by many of the operators.

On the day which it became effective—last Monday—only six of approximately 500 buses had filed tariffs and of these only two were correctly drawn.

None of the northwestern Ohio bus lines have filed the required data with the commission.

The commission has drafted rules which require the bus lines to post schedules, rates of fare, maintain equipment, keep adequate supplies, travel fixed routes, maintain certain safety speeds at dangerous points, and pick up all passengers to certain limits who offer to ride except those "drunken or diseased."

Whenever a fare change is contemplated 30 days' notice must be given the commission. Trailers are only permitted upon the special authority of the commission.

The penalty which the commission will seek soon to impose upon delinquents amounts to \$1,000 a day for negligence in filing any required data.

Annual reports of operations and revenues must be made and special reports on accidents and interruptions to service.

Financial Statements Show British Losses

LONDON, Aug. 5 (By Mail)—It has been the fashion since the war for British automobile, as well as other industrial companies, to hold back their reports and to issue them for periods of eleven and up to eighteen months. The fault or cause is mostly due to circumstances beyond the companies' control, mostly due to delay in getting accounts passed by Government for excess profits tax, and in some cases it is because of delay in getting accounts through for work on Government account.

Thus the new Wolseley Motors trading report is only down to Sept. 30 last. The trading profit was £44,951 (nominally \$224,755) in comparison with £224,620 (nominally \$1,123,100) for 1918-1919, but by reason of increased first charges on first mortgage debentures issued in 1919, the profit is converted into a net loss of £83,581 (nominally \$417,905).

This bad result reflects and, indeed, is directly accounted by the ill effect of the moulders' fifteen weeks' strike, and its loss value to the company in turnover is estimated to be \$5,000,000. The balance sheet shows a bank overdraft of £315,961 (nominally \$1,579,805), while cash at bankers and in hand amounts to £6,701 (nominally \$33,505).

This report also is pessimistic as to the future of British trade abroad.

The G. W. K. Co., makers of a light friction disc drive car, report a loss of £197,497 (nominally \$987,485) on a 16 months' report up to Dec. 31 last.

Stockholders Ready to Back Texas Motor

DALLAS, TEX., Aug. 24—The outstanding obligations of the Texas Motor Car Association, organized for the purpose of manufacturing cars, with headquarters at Fort Worth, will be paid by an assessment of 25 per cent on stockholders, it is announced. The assessment will bring in approximately \$600,000. The outstanding obligations of the company total \$500,000, the receivers stated. The assessment will leave the receivers with \$100,000 to operate with.

The assessment committee is composed of stockholders from many of the larger cities of four States and its personnel and scope of work have the approval of the court. The receivers declared the assessment of 25 per cent will give the 17,000 stockholders in Texas, Oklahoma, Louisiana, Arkansas and New Mexico a chance to get their money back.

It is hoped to have the plant of the company in operation soon. It is believed with the outstanding obligations out of the way and a small amount of capital to work on the business of the company will soon be in operation.

EUGOL IN CHICAGO

CHICAGO, Aug. 22—The Eugol Motor Truck Co., formed by Eugene Goldman, formerly connected with Master Trucks, Inc., has established offices in this city and has a factory in Kenosha, Wis., for the manufacture of a speed truck which will be assembled largely of standard units. Production is already under way and the factory is being enlarged for body storage and painting.

BRAZIL CONDITIONS POOR

WASHINGTON, Aug. 20—According to reports from Sao Paulo, Brazil, conditions in the automobile market of that city are even worse than in Rio de Janeiro. Large consignments of cars are held by the banks by reason of the refusal of the consignees to meet the drafts covering their shipments.